July/August 2008 >> Vol.38

AECMAGAZINE

DESIGN, MANAGEMENT & COLLABORATION IN THE BUILT ENVIRONMENT



ArchiCAD version 12

Graphisoft's BIM modeller goes multi-core

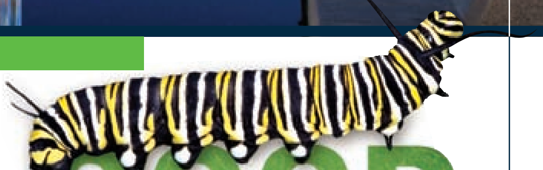
Heathrow Terminal 5

Realising BAA's vision through BIM

Structural special: Tekla Structures, CADS RC, and engineering the Beijing Water Cube



Image courtesy HKR Architects



CHANGE IS GOOD

THE BUILDING INDUSTRY IS FULL OF CHANGE.

And you are constantly trying to keep up. With the big changes in how the profession does business. With the countless small changes made on every project, every day.

How well do you respond to change? Are you sure that every change you make is good for business?

Bentley's **Building Information Modeling and Management** solutions make change a good thing.

By equipping your team to respond to changes effectively, they'll embrace change and see it as an opportunity, rather than a challenge. And so will you.

By changing the way you think about change – you can transform your business.

MAKE CHANGE GOOD FOR YOU.

Bentley® Sustaining Infrastructure

WWW.BENTLEY.COM/BIM

AECMAGAZINE
DESIGN, MANAGEMENT & COLLABORATION IN THE BUILT ENVIRONMENT

Editorial
Managing Editor: Greg Corke
Email: greg@x3dmedia.com

Consulting Editors
Martyn Day
Email: martyn@x3dmedia.com
John Marchant
Email: john.marchant@skilstream.com

Editorial Assistant: Alan Cleveland
Email: alan@x3dmedia.com

Design and Production
Dave Oswald
Email: davieos@googlemail.com

Advertising
Advertising Manager: Tony Baksh
Email: tony@x3dmedia.com

Deputy Advertising Manager: Steve King
Email: steve@x3dmedia.com

Subscriptions
Manager: Alan Cleveland
Email: alan@x3dmedia.com

AEC Magazine is available FREE to qualifying individuals. To ensure you receive your regular copy please register online at **www.aecmag.com**

About
AEC Magazine is published bi-monthly by X3DMedia Ltd

93a Rivington Street
London
EC2A 3AY
T. +44 (0)20 3355 7310
F. +44 (0)20 3355 7319
www.x3dmedia.com

AEC Magazine is printed by
Warners Midlands plc
www.warners.co.uk

Vol.38: Contents



Front cover image courtesy of Graphisoft
Project: Vörösmarty 1, Budapest, Hungary
Architect: György Fazakas
Consultant architect: Jean Paul Viguier

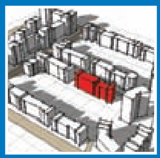
Autodesk releases NavisWorks 2009.1 family



Autodesk has released its NavisWorks 2009.1 software portfolio, which is designed to aid project model understanding and includes a real-time environment for rapid review. NavisWorks 2009.1 products have been enhanced with a DGN v8 file reader, uniting 3D content from Autodesk and Bentley for design validation, logistics analysis and construction scheduling. With the addition of DGN v8 support, the new 2009.1 versions feature compatibility with most native AEC design and laser scan file formats.

www.autodesk.co.uk/navisworks

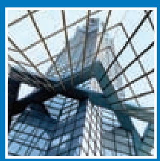
Autodesk acquires Green Building design software



Autodesk has completed the acquisition of substantially all the assets related to the Ecotect software tools for conceptual building performance analysis from both Square One Research and Dr Andrew J Marsh. At the same time the company has launched Autodesk Ecotect v5.60, which includes Ecotect, WeatherTool and SolarTool installs as well as help files, tutorials, example weather data and other useful resources for getting started on Green Building Design.

www.ecotect.com

Luxology to boost MicroStation rendering



Bentley Systems has entered into a technology agreement with Luxology, maker of the modo 3D software widely used by video professionals and graphic artists. Through the agreement, Bentley will license Luxology's photorealistic rendering engine for inclusion in its forthcoming release of MicroStation. According to Bentley, the Luxology rendering engine will allow users to generate images and animations with life-like detail, and enable designers to make real-time decisions from near-real-time rendering within interactive AEC workflows. *Image courtesy of Ahmed Alireza.*

www.bentley.com / www.luxology.com

Océ claims productivity boosts with new software

Océ has launched Océ Client Tools v. 2.1.1, part of the Océ Repro Desk Server and Professional suite of applications. According to Océ, its Client Tools enable CAD users to simplify printing and avoid costly workflow bottlenecks via batch-processing of multiple file types, digital file previewing from the desktop before printing, and local or remote job submission.

www.oce.com

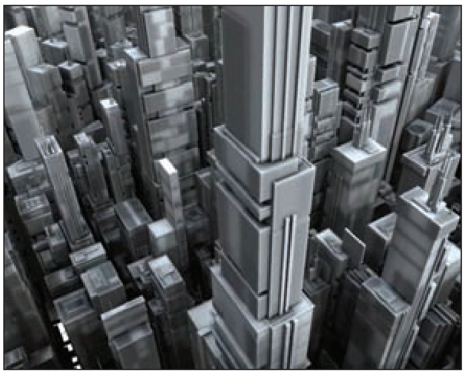


Rome built in a day with new procedural urban modelling tool

Zurich-based Procedural has shipped a new urban modelling solution, CityEngine, which allows for the mass creation of city models for film & TV production, architecture and city planning. The company recently demonstrated its technology at SIGGRAPH with a detailed virtual urban environment of ancient Rome (A.D. 320) which forms part of the Rome Reborn project.

"Cities are huge, richly detailed artefacts that are often required in digital productions, and modelling them with existing tools can take several man years," says Pascal Müller, CEO of Procedural. "The CityEngine addresses these previously unsolved modelling problems by offering several procedural modelling tools for generating large-scale urban layouts, as well as a unique shape grammar for the efficient creation of detailed building models. With these tools, users not only experience a faster modelling experience, but one which allows them to create cityscapes that have never been seen before."

As the core of the CityEngine, the shape grammar has been



designed specifically for rule-based production of architectural content at arbitrary levels of detail. The procedurally generated 3D buildings can be exported in various file formats.

A free 30-day trial version, including example scenes, is also available for download at ***www.procedural.com***

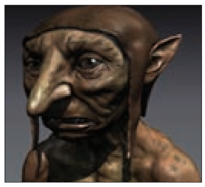
Bluesky launches 3D City Models across UK

Aerial survey specialist Bluesky has launched a new range of detailed 3D city models. The new product range will be available off the shelf and is designed to help improve the management of urban centres providing a new understanding of the built environment with applications including planning and development control, security and emergency response planning, and environmental modelling markets.

Bluesky 3D City Models are created from up-to-date high-resolution, stereo aerial photography to provide a real world, interactive, geographically accurate representation of the built environment. They will be available for every city in the UK with a population over 100,000 and map every building over 140 cubic metres;. Accurate to +/- 60cm the Bluesky City Models also include road detail and an underlying Digital Terrain Map (DTM) to place the urban representation in its true world context.

www.bluesky-world.com

Design freedom offered through CG modeller



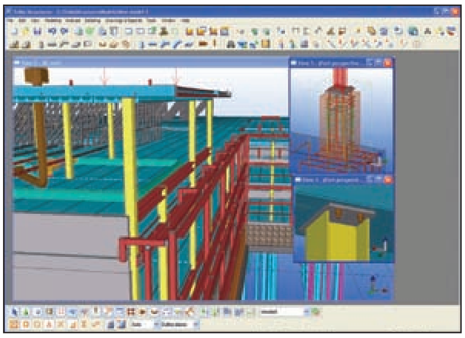
Autodesk Mudbox 2009 is the latest version of a software tool designed to give 3D artists and designers the freedom to model what they want without having to worry about technical details.

Mudbox has shaped characters in blockbuster movies and games, including Journey to the Center of the Earth, The Mist and Mass Effect, but interest has also come from the architectural sector for concept and terrain modelling.

Autodesk acquired the software last year thorough its purchase of SkyMatter. The new release offers greater interactivity while working on high-resolution meshes and improved interoperability with Maya and 3ds Max. Mudbox 2009 is scheduled for release in October with a suggested retail pricing of £450.

www.autodesk.co.uk/mudbox

Tekla teams up with Vico software for 5D virtual construction



Tekla, the Finnish structural software developer and Vico Software, a Virtual construction specialist, have announced the integration of their software packages for what they describe as a true 5D virtual construction environment.

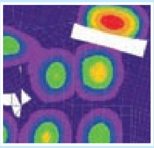
At the heart of the integration is a bi-directional data flow between the Tekla 3D model and the Vico solution, which allows for accurate scheduling and estimating, known as the 4th and 5th dimension of virtual construction. Tekla models feed the Vico solutions which support quantity take off, cost planning, schedule planning and production control processes.

During the design and preconstruction phase of a project, a 5D model expresses a sophisticated view of the building. Drilling in deeper for design review and clash detection with the project stakeholders is claimed to ensure smooth scheduling. This 4D schedule illustrates the sequencing in the construction phases. With 5D estimating in place, the project team is said to be able to answer what-if scenarios on the fly, propose value-engineering options, and keep the project on track for cost and quality.

"This is an excellent opportunity to pair Vico's strengths of scheduling and estimation with Tekla's highly detailed design and fabrication structural model data," says Stacy Scopano, Business Development Manager, Contractor Segment, Tekla Corporation. "Vico's solutions combined with Tekla's Construction Management products bridges a critical gap in the industry's BIM workflows, in providing the ability to analyse planning and performance construction data, in 3D environments." Meanwhile, turn to page 22 for a full review of Tekla Structures 14.

www.tekla.com / www.vicosoftware.com

Oasys releases GSA 8.3 for structural analysis



Oasys, the software house of Arup, has recently launched a new version of GSA, its structural design and analysis software. GSA 8.3 performs a range of analysis and design of structural models composed of skeletal frames and two-dimensional finite elements including static or dynamic, buckling or soil-structure interaction, bridge optimisation and form finding. GSA has been used on thousands of projects worldwide including the Swiss Re, Gatwick Air Bridge and The Water Cube (National Aquatics Centre, Beijing).

In terms of updates GSA 8.3 includes a number of enhancements to footfall analysis. It features the option to analyse according to The Steel Construction Institute's (SCI) P354 "Design of floors for vibration: A new approach", in addition to the Concrete Centre's CCIP-016 "A Design Guide for Footfall Induced Vibration of Structures". The SCI publication provides guidance for vibration design of all steel-framed floor and building types. It extends the previous guidance to special floors such as hospital floors, laboratories and light steel floors etc, where there is a real need to understand floor vibrations accurately.

GSA 8.3 also seamlessly links to Autodesk Revit Structure 2009, by allowing users to export from Revit to GSA, update Revit from the GSA model and create new Revit models from GSA via the GSA/Revit Structure plug-in.

Meanwhile, CSI ***(www.csiberkeley.com)*** has released v12 of SAP2000, its integrated software for structural analysis and design, and the developer of Space Gass ***(www.spacegass.com)***, a structural engineering analysis and design program for 2D and 3D frames, trusses and beams, has announced a link to Revit Structure 2009.

www.oasys-software.com/gsa

IES strengthens building performance visualisation

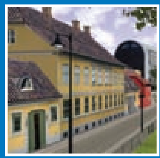
Integrated Environmental Solutions (IES), a specialist in integrated performance analysis software and consulting services for sustainable building design, has announced the availability of version 5.9 of the full IES <Virtual Environment> suite. IES <Virtual Environment> v5.9 offers a suite of building performance analysis tools that enable designers to look at how key design and climate factors influence the sustainable performance of a building.

For the new release, major refinements to the drawing and visualisation capabilities of IES's central 3D data model builder have been made. It now includes the ability to record camera path animations, change the sketch styles and add textured rendering. IES has also made significant changes and additions to its reporting functions. In particular, unique new 3D model result visualisation options are offered – bulk airflow through openings, and room colour coding according to result/input data thresholds. In addition, new Swirl Diffuser technical enhancements to IES's CFD airflow analysis mean that Underfloor Air Displacement systems can now be modelled in greater detail.

Meanwhile, according to IES, new Dynamic Simulation Model (DSM) Energy Performance Certificate (EPC) and Republic of Ireland Building Energy Rating (BER) compliance capabilities mean that it now offers the most comprehensive regulation software on the market.

www.iesve.com

myVR enables streaming over the Web for 3ds Max



VR Software AS, a specialist in streaming large 3D models over the Internet, has announced that its myVR product line now supports Autodesk 3ds Max 2009 and 3ds Max Design 2009. According to the company, the patented technology allows users to quickly generate and distribute large 3D models at high speed and high resolution over any network even with limited bandwidth (Edge, 3G, low speed (A)DSL etc.)

www.3dtogo.co.uk

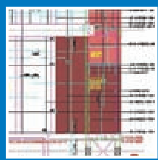
Olympic TV tower designed with ArchiCAD



The Olympic TV Transmission Tower used to broadcast the Beijing Olympic Games to the world was designed by local Chinese architects in just three months to meet the final Olympic preparation rush. Located near China's National Stadium, the transmission tower is 132m high and according to the architects, ArchiCAD's integrated model based workflow was vital to the completion of the entire design and documentation work in such a short period of time.

www.graphisoft.com

CADS to boost education in structural solutions



Structural software specialist, CADS, is opening a new office and training venue in Chesterfield, Derbyshire to help provide a larger range of courses for users of its AutoCAD-based CADS RC and Advance Steel detailing solutions. The company is also hosting its 'Total Building Solutions' seminar over the coming months to highlight the interoperability of SMART Modeller, Revit Structure, CADS RC and Advance Steel. Meanwhile turn to page 26 for the latest on CADS' RC detailing solution.

www.cadsglobal.com/events

Excitech adds value to Autodesk Subscription

Autodesk reseller Excitech has just launched e-Learning tutorials for its Autodesk subscription customers. Companies who have bought Autodesk subscriptions through Excitech will have access to the e-Learning module for AutoCAD 2009 via Excitech's website. The course is designed to lead users through the new and improved features of AutoCAD 2009. Users of applications based on AutoCAD 2009 such as AutoCAD Architecture will also benefit from the structured online help files, video materials and example files.

www.excitech.co.uk

Autodesk and Bentley exchange formats

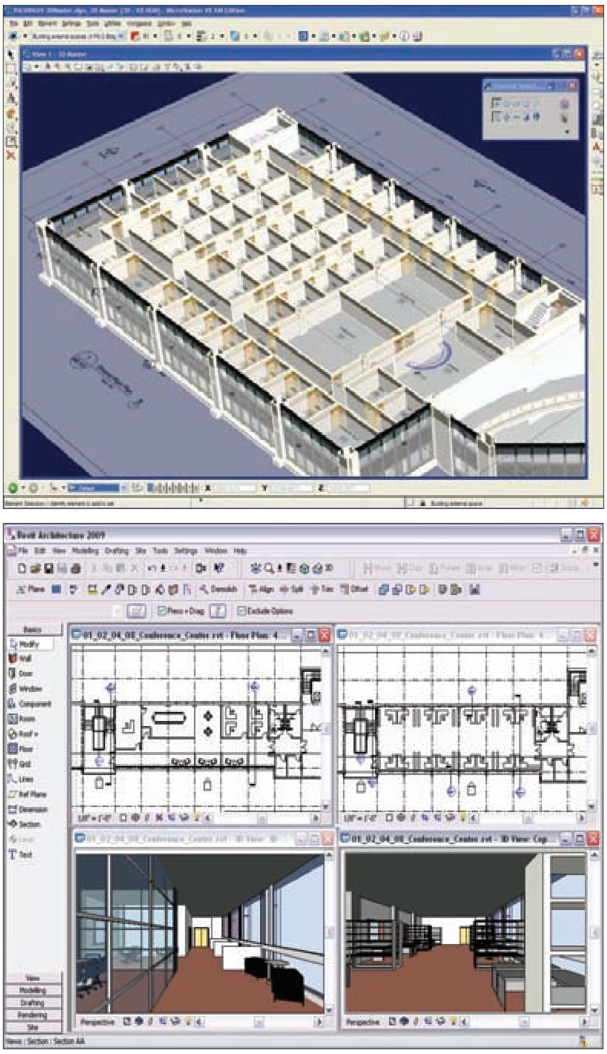
Interoperability is one of the industry's constant thorny issues. Proprietary CAD formats, like the world's languages, create a virtual Babel and generate barriers to understanding engineering information. **Martyn Day** examines the latest news from Autodesk and Bentley.

Interoperability is a critical issue for users of design and engineering software. A 2004 study by the U.S. National Institute of Standards and Technology found that users bear direct costs of almost $16 billion annually from time wasted due to inadequate AEC software interoperability. In news that shocked the industry, Autodesk and Bentley Systems, strong competitors, announced an agreement to expand interoperability between their portfolios of Architectural, Engineering, and Construction (AEC) software. Autodesk and Bentley will exchange software libraries, including Autodesk RealDWG and Bentley DGN, to improve the ability to read and write the companies' respective DWG and DGN formats in mixed environments with greater fidelity. In addition, the two companies agreed to facilitate interoperability between their AEC applications through supporting the reciprocal use of available Application Programming Interfaces (APIs).

In short, this means that Bentley gets to have direct access to DWG via RealDWG and will get API access and technical support for applications developed for AutoCAD, Revit and other Autodesk AEC applications. Bentley users will also be able to benefit from being able to run AutoCAD-based object enablers in the enabled Bentley products. In return, Autodesk gets access to Bentley's MicroStation, ProjectWise and other AEC product development tools, and Bentley will develop a 'RealDGN' type of library for Autodesk to include in its products. This will limit reverse engineering and errors and will enable the two companies to develop products for both companies' customers.

Autodesk vs Bentley history

Without a doubt, Autodesk is the biggest CAD software company in the world by volume, having shipped millions of copies of its flagship drafting tool, AutoCAD, all over the globe. While Autodesk sells volume products through resellers, Bentley on the other hand, goes to market largely through its direct sales team and has had a great deal of success supplying vertical solutions of its MicroStation CAD platform to a number of markets that Autodesk has had less impact in, including Plant, Civil/Transport Engineering, and Geospatial. Where Bentley and Autodesk have a long history of competing is in the AEC market, with Autodesk winning on numbers but Bentley being the choice of more signature architects and big architectural practices, with nearly 90 percent of the ENR (Engineering News Record) Top Design Firms being Bentley subscribers.



Interoperability issues between applications like Autodesk Revit Architecture (bottom) and Bentley's MicroStation V8 (top) could be a thing of the past with this new landmark agreement between the two AEC software giants.

With Autodesk dominating in numbers, it's hardly surprising that the DWG file format of AutoCAD is the de-facto standard in the AEC space. In fact, as vanilla AutoCAD and LT are so widely used in all industries, it's pretty hard to find a design space where the DWG format isn't popular. This has caused all sorts of data translation issues for Bentley and therefore its customers and the industry at large. Bentley had to constantly reverse engineer the DWG format and try to support it within the context of MicroStation. While working out what the contents of the DWG format is not such a big deal, mapping these elements to MicroStation elements are where the problems really get complicated. The early releases of MicroStation only supported 63 levels or layers, while in AutoCAD you could have as many as you wanted. This was further exacerbated when industry-standard layering conventions defined 256 layers, which MicroStation could obviously not support. So, mapping AutoCAD geometry to MicroStation geometry wasn't much fun, if as it would always require translation and that meant some data was lost or compromised.

Year after year, I would attend Bentley events where users would always ask for more software interoperability among all of the vendors in the infrastructure community. And many strategies and mapping tools were delivered with varying degrees of success. It wasn't until MicroStation V8 that Bentley really got a grip of the DWG issue with an ingenious solution.

Bentley rarely if ever changes its file format, while Autodesk seems to update DWG every 2-3 years. For the first major change in almost 16 years, Bentley changed DGN with MicroStation V8. Amongst the reasons for the change, was to expand the architecture to better support DWG workflows. The company chose to take AutoCAD elements that were described in DWG and include them as a sub-set of the MicroStation feature set, so the software could be used in AutoCAD clone mode, where you could only create elements that AutoCAD could understand and on import MicroStation didn't need to translate the DWG elements as they were supported natively. So, for customers the compatibility situation drastically improved.

In terms of competition, Bentley hasn't been a particularly strong blip on its competitive radar, with Autodesk more concerned about Dassault Systemes and SolidWorks I the last few years. That said, Autodesk hasn't been complacent in keeping an eye on Bentley. When Bentley acquired technologies it has demonstrated a passion to buy developers that had products for both MicroStation and AutoCAD and so with every developer that Bentley acquired, Autodesk was quick to lock these out of its AutoCAD developer program, generating

a fair amount of animosity. Bentley's acquisitions have been especially sharp, aiding it to own the Structural and Civil analysis markets. These are technologies that Autodesk would like to have and it's widely quoted that Autodesk management think that Bentley should 'dump MicroStation' and become Autodesk's biggest third party developer!

However, when one looks at the reinvigoration of software development at Autodesk since Carl Bass took over as CEO, it's clear to see that Autodesk wants to play in the areas that Bentley has carved out as core niches – namely Civil/Transport Engineering, Plant, Infrastructure and Geospatial. This ambition is backed up by Autodesk's recent internal development of limited DGN capability for its AutoCAD and Revit software tools. For the first time, Autodesk really feels it needs to gain access to data that's held in DGN.

So we have two old competitors that have a need to access each other's formats. Bentley has an array of analysis, document management and vertical solutions that could benefit and Autodesk is looking to move into traditional Bentley markets with new tools and is also developing it's own Green building analysis tools.

There is another dynamic to this move. Autodesk has it in for the Open Design Alliance (ODA), a company that funded by its competitors (PTC, SolidWorks, Bentley, Dassault etc.) to constantly reverse engineer the DWG file format and create libraries they can use in their CAD products. While the ODA says they invited Autodesk to join, Autodesk CEO Carl Bass told me that the deal was never a fair one, as they would have to 'tell all about DWG' to join but none of the other vendors were willing to open up their formats and give Autodesk equal access. Since Bass took over, Autodesk's litigation and technology moves made against the ODA have been accelerating, while simultaneously Autodesk has been picking off ODA members by signing direct deals for format library swaps, removing their need on the ODA. The list of vendors is small but significant, both PTC and now Bentley have taken Autodesk up on their offer of library swaps.

Autodesk has now engineered the DWG file format so that it incorporates a small piece of encrypted code that contains a sentence which is copyrighted, it's a clever watermark. When AutoCAD opens up a DWG that isn't from an official Autodesk product, it would see that there is no watermark and automatically warns the user that they are opening a file not generated by AutoCAD and therefore may be corrupt. By definition the ODA could not reverse engineer this otherwise it would break copyright. However it did and Autodesk sued.

The almost-launch

At this year's Bentley BE conference in Baltimore the cat was almost let out of the bag when a PR slip up meant the press saw that Autodesk CEO Carl Bass was due to appear by satellite link, and even that didn't happen. It's now obvious that this was as the deal was still in progress and not ready for announcement. It took three-four weeks longer to be made public. I have heard that the delay was over Bentley wanting the API access.

What will Bentley get out of it?

In some ways, Bentley had circumnavigated the DWG issue by incorporating the DWG elements in the DGN. However, Bentley's CTO, Keith Bentley talks about the confidence factor of having official libraries and not having to wait for the ODA to reverse engineer and bypasses the watermark issue introduced recently by Autodesk. With API tools Bentley also gets access to all the 'object' intelligence with the AutoCAD verticals and being a pseudo-official developer will open up new markets for them.

Bentley's problem here is that it doesn't have a broad volume channel, so while it may be able to produce products that could be sold to AutoCAD and Revit customers, you do have to wonder how demand will be driven and fulfilled. I am pretty sure the deal doesn't include Bentley's access to Autodesk' global resellers and therefore Auodesk's installed-base. However, It will help Bentley sell more to customers that run a mixed environment and will make it easier for the company to get some foothold into big AutoCAD-dominant projects.

What will Autodesk get?

From its own efforts at great cost, the DGN developed at Autodesk was only 2D and now they can have the confidence of having reciprocal 2D and 3D access. DGN access is the key for new markets for Autodesk and they will undoubtedly be after MicroStation's markets – a risk which Bentley has obviously weighed up and accepted the trade off.

However, as AutoCAD doesn't support or understand some concepts that are core to MicroStation's DGN format, while it will be able open, display and query documents, hybrid DWG/DGN files will require translation and therefore imperfect results. To get the most out of the deal AutoCAD would need to match the element types that are in DGN. Here, Bentley has a distinct advantage to get off the blocks quicker than Autodesk's DGN inclusion.

Autodesk also continues to turn up the pressure on the ODA. Another key member pacified and Bentley was a significant supporter. The ODA also produces DGN libraries and Bentley will continue to provide the documentation and technical support to the ODA for the libraries the ODA creates. However, Bentley is under no obligation, and does not have any intention to deliver the new Bentley DGN Toolkit to or through the ODA

What will customers get? This has yet to be really stated but one can say this is a massive win for all customers and the industry as a whole. Interoperability issues won't vanish but they will be greatly reduced. It will not mean that DGN and DWG are interchangeable and that there will be no differences. Bentley is very vigorous about explaining the richness of DGN and the capabilities of MicroStation over AutoCAD. I dare say Autodesk would have a contrary opinion to this. It's one marketing war over, a new one starts.

"It's clear to me that Bentley has struck a great deal with Autodesk, certainly in the short-term. RealDWG and AutoCAD, Revit and other AEC application API access, together with V8 compatibility will mean that Bentley can be quick off the blocks to make some impact with this."

Conclusion

This agreement is really co-opetition, making life easier for everyone all-round. It's the most significant and positive move in the history of Computer Aided Design in the AEC space. If the agreement continues and both parties play fair then there will be significant advantages in the coming years for the industry as a whole.

It's clear to me that Bentley has struck a great deal with Autodesk, certainly in the short-term. RealDWG and AutoCAD, Revit and other AEC application API access, together with V8 compatibility will mean that Bentley can be quick off the blocks to make some impact with this. Bentley has loads of existing products that either sell or could sell into AutoCAD workflows, like the analysis tools or ProjectWise.

To me it seems that Autodesk is on a long play here. It wants to get into Bentley's traditional markets and the company doesn't seem to like to spend much on reverse engineering formats. Carl Bass has told me many times that he doesn't have any issues in swapping APIs or DWG and competing on application capabilities and he is doing more than just talking about it. Autodesk's two target areas are Bentley and PTC's core markets, now they have open access to both data formats. While the technology may not be as quickly deployed in shipping products, Autodesk has plenty of time, money and sales-breadth to leverage increasing competitive format knowledge.

There has been talk of Autodesk acquiring PTC and/or Bentley. On analysis this isn't too far off plausible. As PTC would complete the Mechanical Division's technology suite and Bentley would give Autodesk a massive boost in all the AEC areas it has recently jumped into (especially Plant and Civils). By letting these firms build-in native AutoCAD DWG capability, an acquisition would face less of a technological upheaval, as there would be at least some degree of official compatibility. One also has to look at Autodesk's market capitalisation which puts them in a good place to make some major acquisitions in the coming years, so long as the USA's FTC (Federal Trade Commission) doesn't think there's a monopolistic situation in an acquisition of either. If this is a 'come into the parlour said the spider to the fly' type of situation, it's not going to be immediately obvious or rapidly chased but Autodesk is working to a very broad strategic plan. We don't know who is on the menu but there is certainly a cooking smell emanating from Autodesk's HQ in California.

Conjecture aside. It's a time to rejoice.

www.autodesk.com

www.bentley.com

The move to BIM with ArchiCAD 12

Recent market conditions have coalesced to drive a massive take-up of Building Information Modelling (BIM) tools. **Martyn Day** looks at the benefits of this fast-growing technology.

Looking at the sales of architectural design tools, it's clear to see that the design market has started a mass migration from 2D draughting to 3D modelling, from merely documenting designs to building complete Virtual Buildings. While the technology has been around for many years, new market dynamics and maturation of solutions has created a technology tipping point, where a process called Building Information Modelling (BIM) is assisting practices to seek new methods to improve efficiency, reduce errors and increase profits. Recent events such as the downturn in some world economies and move towards 'green buildings', are also driving a rethink of the design process, with a model-centric approach providing new possibilities and business models.

"ArchiCAD version 12 is an excellent release for existing customers, of that there is absolutely no doubt. The system performance benefit alone justifies the upgrade."

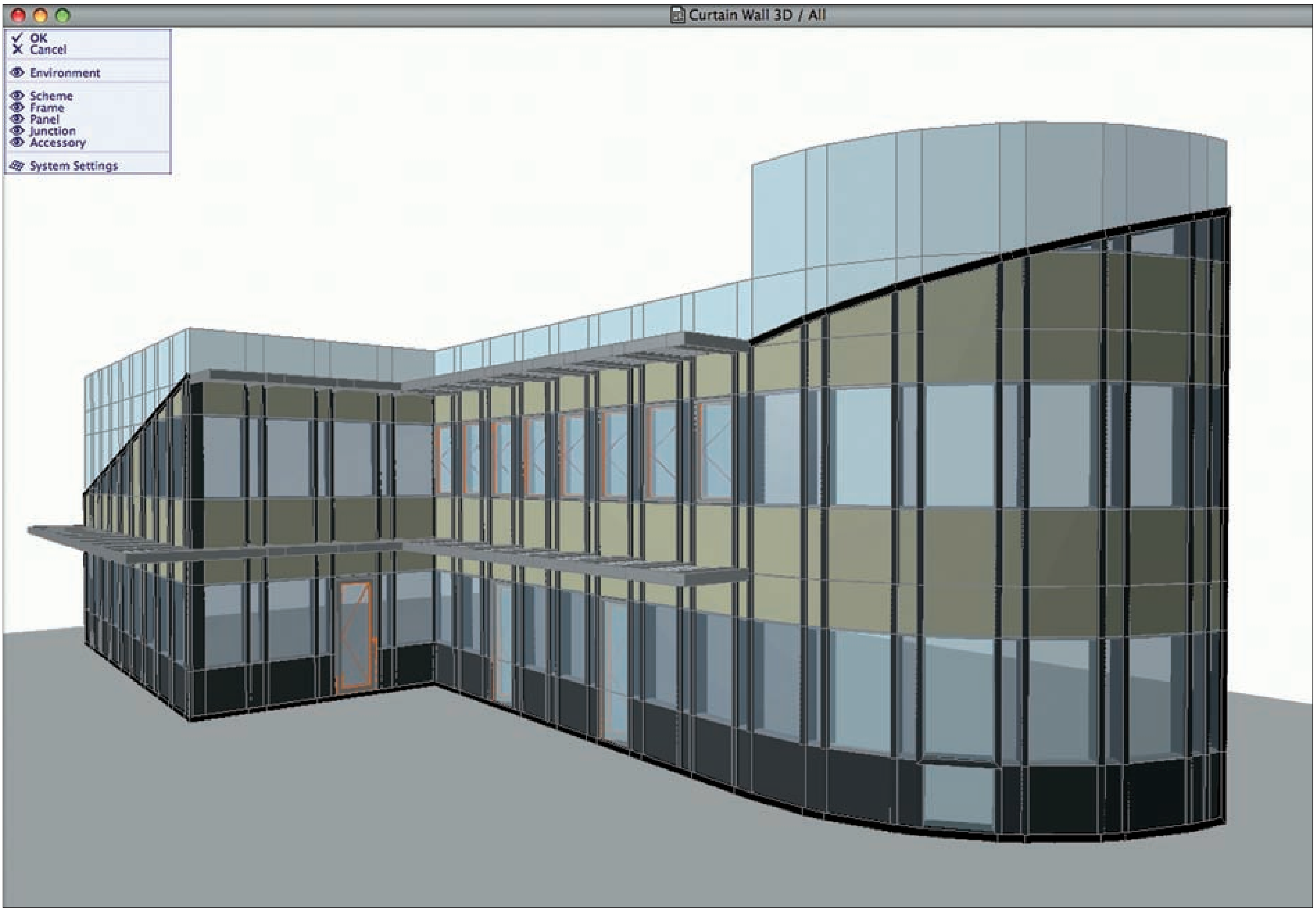
These market conditions are further bolstered by many innovative practices, which have already tried and tested these new systems and processes. And modelling-savvy graduates leaving universities and entering practices are promoting model-based design strategies. This migratory trend towards BIM was highlighted in a recent market survey by McGraw Hill published at the start of the year where an amazing 50% of the firms that responded said they were going to have a BIM process in place and implemented by the end of 2008.

BIM relies on the fact that a central Virtual Building is created of the design, from this schedules, quantities, plans, sections, elevations, details and general assembly drawings are all automatically derived. Should an edit be made, then all the corresponding sheets can be updated in a co-ordinated manner. There are additional benefits, in that the model can be used to produce interior and exterior rendered images and walkthroughs, as well as serving as the base geometry to perform thermal, lighting, solar, and carbon footprint analysis for building compliancy testing.

Graphisoft's ArchiCAD

Based in Budapest, Hungary, Graphisoft was established in 1982 and proved itself to be an innovative Apple Macintosh-based CAD development company. It offered the first combined 2D and 3D CAD product for personal computers. ArchiCAD is the company's BIM solution for the building industry, and over the years has grown to have a user base of over 100,000 architects on both Apple Macintosh and Windows platforms. Now in its 12th release, ArchiCAD is the most mature BIM solution for architects, having trail blazed the Virtual Building approach to design years before any of the other vendors. With a commitment to Mac and PC, ArchiCAD is also the only BIM solution to run on both platforms. With the resurgence in

The new curtain wall object in ArchiCAD 12 is probably the most comprehensive, adaptable and easiest to use Curtain Wall tool we have seen. Its applications go way beyond producing standard curtain walling.



> **"Many of the new features of ArchiCAD 12 are about ease of use, flexibility and enhanced communication. However the new curtain wall tool really is probably the most intelligent solution to a very complex problem."**

popularity of Apple, this puts Graphisoft at the top of the list for any Mac-based architect.

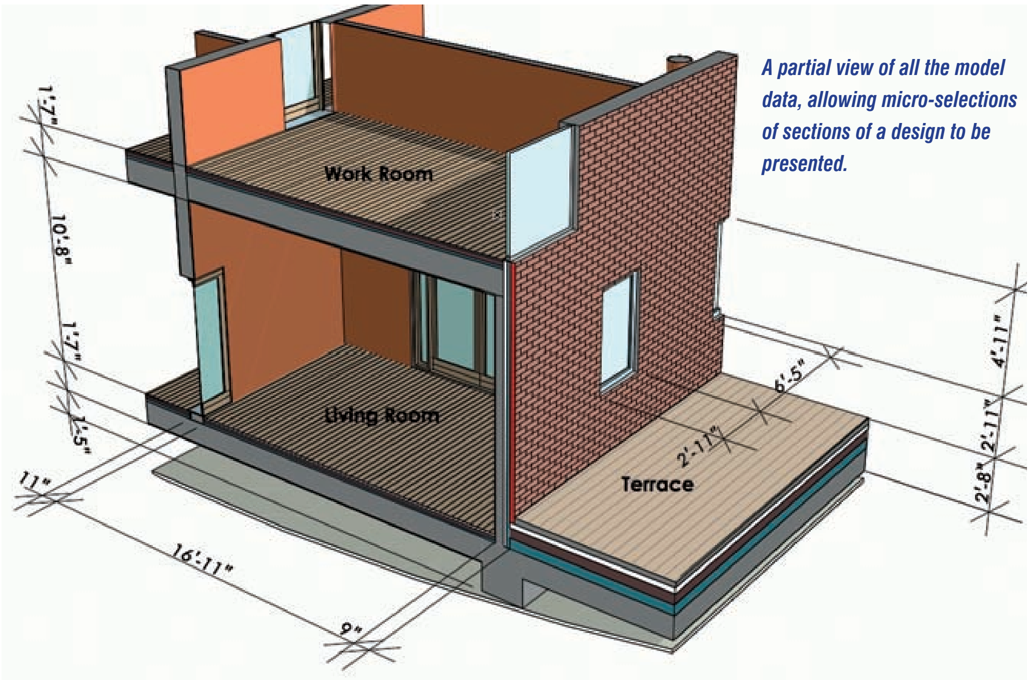
The basic principle of ArchiCAD is the Virtual Model. Working live in 3D, the architect constructs designs using parametric, intelligent walls, doors and windows, together with other common elements like slabs and curtain walls. This can be done at any stage of the design process. These intelligent objects contain different display behaviour, depending on what view and document of scale the architect changes to. You can change your view and make edits and all the views will update.

To get the 2D drawings out of the system, all plans, sections, details and elevations are extracted from the 3D central model, or Virtual Building. Changes made to the model will be carried out through all documents. You can add traditional 2D elements to the drawings too, like polylines and splines, hatches, dimensions and annotations. These layouts can be printed, plotted or uploaded to the web. For file output, ArchiCAD supports DWG (AutoCAD), DGN (MicroStation), DWF (Autodesk Web Format) and PDF (Adobe Acrobat).

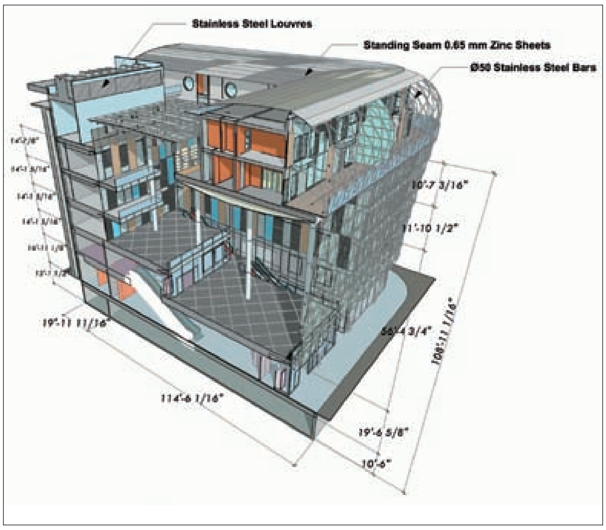
But BIM is not just about documentation. By adding these smart parametric objects and zoning areas, additional information is being added to the model which can be extracted at any time in the process. Schedules and quantity take-offs almost become a bi-product of the design process. There's additional flexibility in that these lists can be customised, and again if the model changes, these schedules and quantities update.

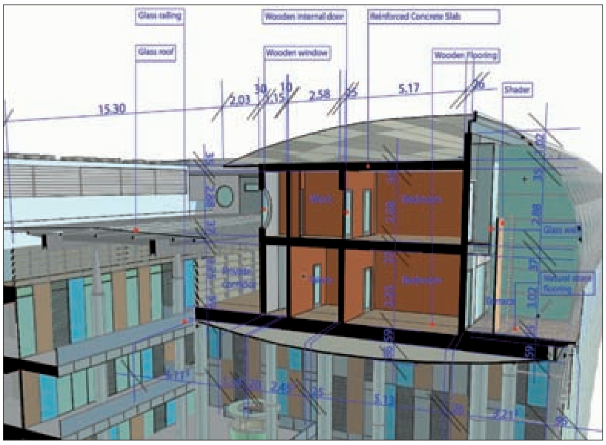
Having designed a complete 3D model, it's also possible to use the built-in rendering tools to generate photo-realistic or artistic images to sell design ideas. Using the Lightworks ray-tracing engine, ArchiCAD can produce some stunning renditions, incorporating transparent and translucent materials, with reflections and soft shadows.

With buildings being specifically identified as major pollution sources and energy wasters, there are a growing number of standards that either require compliance or are being built into client tenders. Traditionally, architects have had to rely on experts from outside to get feedback on the performance of their designs. Virtual Building systems like ArchiCAD, which contain all the necessary information; volumes, materials, gazing areas and geographic location can enable any practice to utilise one of any number of popular analysis packages to evaluate a design's Green Building compliance and optimise the design. Graphisoft's commitment to XML and Industry Foundation Classes (IFC) provides an open framework to transfer intelligent model data to these systems.



A partial view of all the model data, allowing micro-selections of sections of a design to be presented.





Graphisoft's new 3D document really brings models to life, offering sketch-like views of projects with perspective dimensions and text. This is great for presentations.

New in ArchiCAD 12

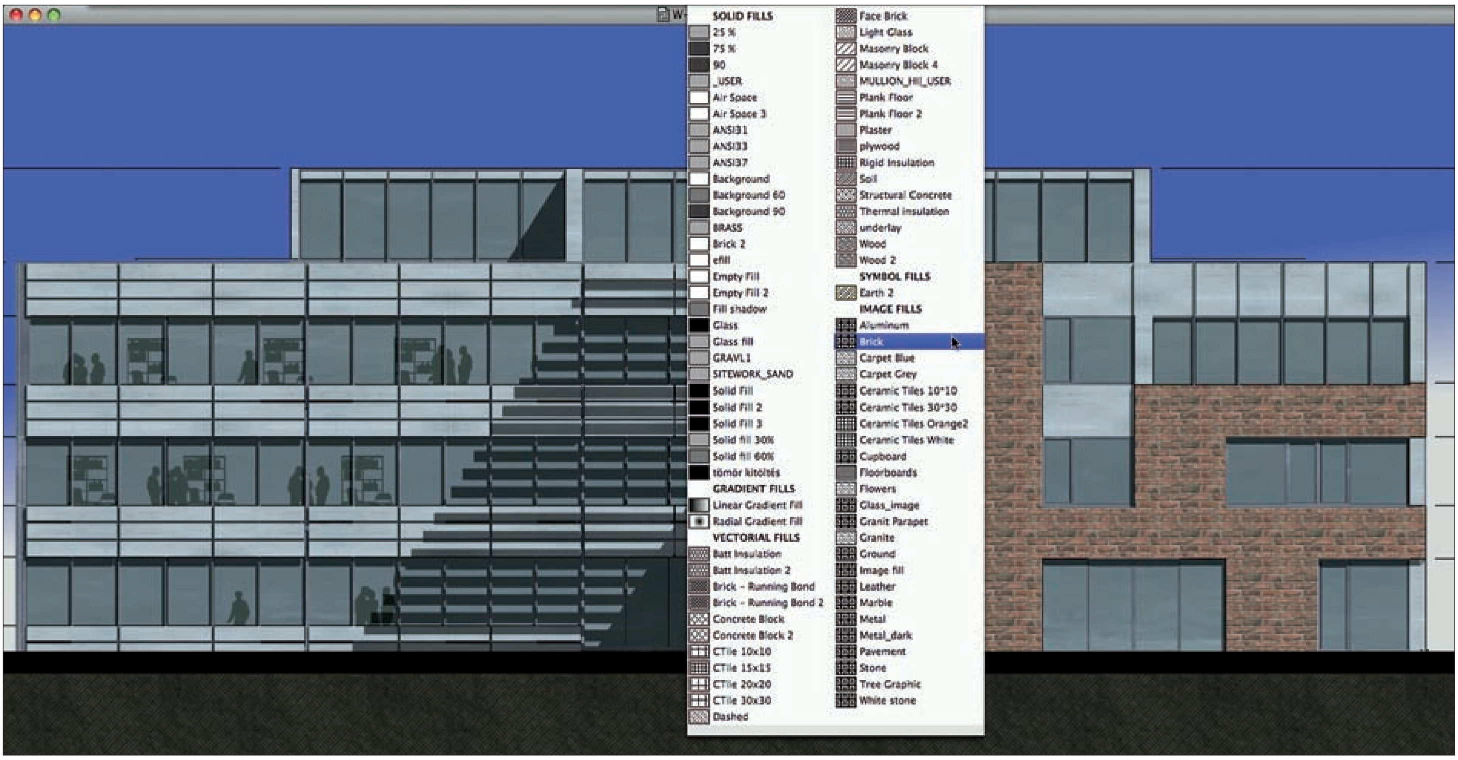
The latest release of ArchiCAD 12 has a number of very powerful enhancements that are immediately obvious from initial boot up. Version 12 sees work in the three key areas of Speed, Design and Documentation.

The first and for me the most fundamental improvement to ArchiCAD comes in its speed enhancement. For the first time ArchiCAD makes use of multi-core processors, which are now standard in all new machines. Most Intel processors have two cores and multi-processor machines can have eight cores or more. In fact, in the future Intel say that we can expect machines with hundred of parallel processors.

It's a major architectural change to re-write the core code to make use of multiple threads and farm out the grunt work to these multiple cores. In 12, Graphisoft has done an exceptional job of this, accelerating modelling, shadow casting, creating 3D views, sections, elevations, rendering panning and zooming – to name just the most used features. For customers this means less time waiting. Virtual Models are compute-intensive and to perform complex operations on large models has traditionally led to a tea break. With ArchiCAD 12, performance has seen speed boosts of over 100%. This for me makes the release a no-brainer for those thinking of upgrading.

Moving to the Design updates, the most impressive addition is the new Curtain wall tool, which is possibly the most comprehensive and flexible approach to creating curtain walls that I have come across. Graphisoft has implemented a hierarchical system, where a user creates a 'scheme' for a curtain wall in a very visual wizard, defining the layout of physical members and panes to great detail. When applied in the model, the curtain walls work beautifully producing perfect joins and making light work of complex systems. The user can edit on the fly. One of the demonstration datasets shows how the new curtain wall system could be used to create walls, floors even roofs if necessary. It's probably the most flexible object in ArchiCAD's armoury. Based with this new component philosophy, future releases of the product will see other key building elements re-worked in this way.

Long overdue but welcome, the ArchiCAD Stair tool has had some attention, providing four new stair



types and better 2D documentation and representation. Users would typically have to do manual drafting on the 2D representation; with 12 that's no longer necessary. There are many more parameters than before, offering enhanced flexibility. The four new types of stair include: Single Winder at Low-end, Single Winder at Upper-end, Single Winder U-Return and Double Winder U-return.

A new display mode called 'Partial Structure Display' lets users work in a wall and slab view, which helps when working with structural members or a structural engineer that is adding load-bearing elements to the model. These elements can now easily be selected and exported to structural applications.

Placing elements gets a couple of handy new features too. A new small but useful addition comes in the form of a Nudge tool, which allows one or more elements to be selected and moved small increments with the arrow keys. This works in both 2D and 3D. Align and Distribute is a powerful tool that lets users select 2D or 3D objects, which can be placed along a set path in user-defined patterns. This could be table and chair objects or points on the face of a wall.

Documentation and formats

Dimensions can never be flexible enough and Version 12 beefs up the intelligence and flexibility of placing dimensions. Now the process is much more interactive with the user being able to get immediate live feedback. It seems most things can be set on the fly, giving dramatic improvement in productivity and ease of use.

Fill has had some powerful additions, where translucent solids, transparent gradient and images fills have been added. These are great for competitions or client presentations and means that the views no longer need to be imported into tools like Photoshop for finishing off.

Rending Fills have been greatly improved and therefore so has the presentation quality of ArchiCAD's output.

A big update improvement allows model data and finishes to be stripped and sectioned away providing only the core geometry for quick and easy dimensioning.

Finally documentation embraces 3D in a meaningful way. Now you can use any 3D view generated in ArchiCAD to create a document where dimensions, annotations and 2D drawing elements may be added. These really do make for more effective communication of design intent than a 2D drawing. A number of these provided on-site really could assist any confusion as to the design intent.

Support for AutoCAD DWG 2008 has been added, together with ACIS import, which will convert AutoCAD 3D solids, regions and bodies into corresponding ArchiCAD GDL objects. When saving down to a DWG file you can now make more compact files by purging unused data and elements that are not necessary or will be used.

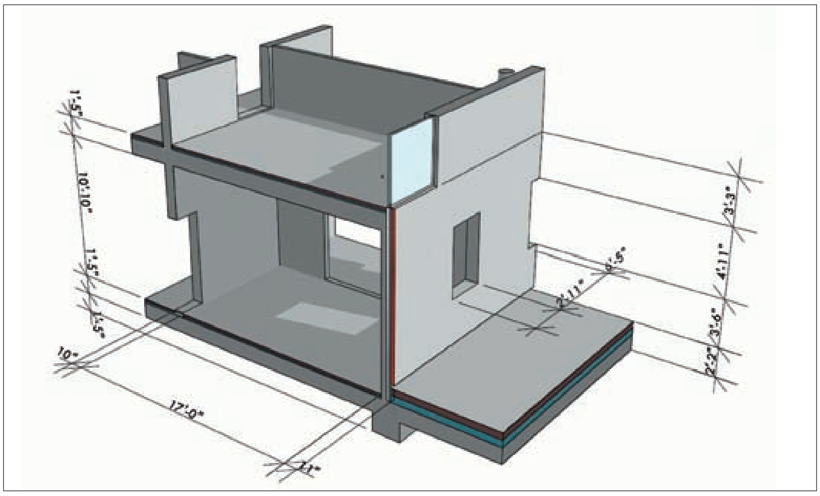
Conclusion

ArchiCAD version 12 is an excellent release for existing customers, of that there is absolutely no doubt. The system performance benefit alone justifies the upgrade. With most recently acquired machines having processors with multiple cores ArchiCAD is the first BIM modeller to properly unleash the investment in recent and future hardware. It's the first CAD system I have used that uses all eight cores of my Apple workstation.

Many of the new features of ArchiCAD 12 are about ease of use, flexibility and enhanced communication. However the new curtain wall tool really is probably the most intelligent solution to a very complex problem that I have seen. The methodology behind its implementation makes curtain walls so flexible that they could be used to generate really complex facades or other surface elements.

If you have not yet started your move to a BIM process, ArchiCAD should definitely be on your list of products to be evaluated and piloted. When moving from an AutoCAD/2D document-driven process, transitioning to any product that supports 3D BIM will include the same amount of disconnect with similar investment and planning. There is no upgrade from 2D to BIM; it's a completely different way of working and there is, without doubt, a critical mass of practices that are planning to make that transition.

www.graphisoft.com





Heathrow Terminal 5

A look at the project, the challenges, the lessons learnt and the implications on future projects.
By **Bob Garrett**, Excitech.

The design and construction of a new airport terminal presents a unique challenge unlike any other building. In the case of Heathrow Terminal 5 it had to fulfil numerous functions including retail facilities, rail terminal, multi-storey car park, river diversions, production line (handling baggage) and office suite as well as the obvious passenger handling facilities. Furthermore, its construction, design and mere existence attracted other additional complexities from a high profile public planning enquiry to the need for security unlike any other public building, project or area.

With such complexity and unique challenges one might have expected most organisations, when planning such a development, to consider only traditional, tried and tested approaches. BAA, however, considered that there might be much to gain in adopting new methodologies in design and construction as well as in project and contract management; and perhaps most unusually it, as client and owner, chose to manage the project from design to construction and to carry the associated risks.

In this article we look at the overall design project from its inception through to completion; how it met its goals, the lessons learnt and the implications already affecting other projects.

A brief history

Astonishingly the T5 project goes back around twenty years to the late 1980s with a first design milestone in 1989 when the then Richard Rogers Partnership won the design competition. In 1993 planning applications were submitted and from 1995 to 1999 a public enquiry examined the need and every aspect of the design before producing a report. This resulted in government approval in 2001, though subsequent challenges and more local approval processes lasted until 2003.

Earlier projects demonstrated to BAA the importance of a more collaborative design process and this was reinforced in 1995 when the investigation into a tunnel collapse at Heathrow Central was hampered by the lack of a central design data source. In 1996 Excitech commenced a project to investigate how geographical information and building design data could be brought more closely together. Through various iterations of AutoCAD-based technologies, Excitech, together with BAA, BA, TPS, Mott McDonald, Laing O'Rourke and Arup, assembled systems that demonstrated not just that it was possible but the benefits it would bring and some of the issues which would need to be managed. In 1997 these techniques were applied to over four gigabytes of data from BAA and other companies involved in construction at Heathrow. This vast quantity of data was manipulated and merged from the various formats, co-ordinates systems and units to form a single model environment (SME) conforming to BS1192 part 5. This SME was not a single file, but it ensured any item was only represented once and was related to the whole through that single model environment.

Following this Proof Of Concept, Excitech was appointed as CAD consultant to the project and, together with the other suppliers to BAA, commenced setting out CAD standards including the processes and procedures that would ensure their implementation and success through the design process and beyond.



"Building a 3D model from day one and then using that model to resolve issues before you get to site is a huge opportunity in this industry. We have made a massive step forward in this direction on T5. If we had not used such an approach, we would not have built the terminal as quickly and efficiently as we did."

Dr Chris Millard, Head of Engineering Terminal 5 Programme and Head of Technical Leadership BAA Capital Projects



In 2002 construction work began on a "programme" entitled T5; but this was further broken down into some 18 major projects, each of which were still of significant size. That same year the main design tool was migrated to AutoCAD Architecture (at the time called Autodesk Architectural Desktop), which made the management of 3D data and objects more efficient. This was alongside other software including MX, CAD-Duct, 3D+, Xsteel and other applications including NavisWorks.

In 2003 further work went into a design specification as to how design data – in the form of objects – could be used within BAA maintenance systems for subsequent management of the assets within the building (and the rest of the infrastructure). This resulted in enhancements to the design object data and the establishment of links and processes for databases external to the design data. The same year erection of the innovative roof commenced even while the detailed internal design was still evolving.

2008 finally saw the opening of Terminal 5, with

some initial operational problems in managing the logistics of baggage handling, but on time and on budget.

Design project goals

The overriding objective behind the design and construction of T5 was to ensure it was delivered on-time and on-budget; but people count too, so safety and "team-working" were also paramount. However, the project looked beyond just design and construction. As both "developer" and "client", BAA recognised the importance of ensuring that the "T5 Asset" should be efficient (economical, ecological and effective) throughout its life.

To deliver these goals BAA set out various initiatives including, but not limited to, the following.

BAA established a different way of working with its suppliers and subcontractors for T5 with a Framework Agreement aimed at facilitating more collaborative working between all the companies involved. It did not want time (and money) wasted on disagreements between its suppliers or BAA itself, and to do this it accepted much of the risk upon itself.

As part of accepting that risk, and indeed to reduce the risk, BAA sought to manage the design and construction much more closely and to introduce the latest techniques in design data management as well as off-site manufacturing for construction.

From a design perspective a number of aspirations were set with the intention of supporting BAA's goals. Core to these aspirations was the "Single Model Environment" (SME), which was subsequently adapted to the "Common Data Environment" (CDE) to recognise an even broader purpose. The SME/CDE brought many benefits.

- It made core project information available to all who needed it so increasing understanding and team working
- It maximised use and reuse of design and project data; so reducing redrawing and the risk of errors
- It provided a design environment for all design disciplines; so data was consistent
- It maximised use and reuse of design and project data; so reducing redrawing and the risk of errors
- It formed a single source of information so increasing quality and consistency

Working in conjunction with the SME was the concept of object-based design where designers do not place basic lines, arcs and circles but real-world objects like beams, doors, floors etc. This, in turn, carried additional benefits to the designers, to the project, to the contractors and to BAA.

- It made CAD work more interesting and increased productivity in the design stage
- It provided an object modelling capability for all design disciplines; so data was consistent
- It stored not just graphical information for drawings but property sets and intelligence for each object

BAA have an initiative in place named AMA (Acquire and Maintain Assets), which has the goal of ensuring that all assets are acquired and maintained in the most efficient manner. This initiative influences all projects to ensure the right procedures and systems are in place for the entire lifecycle of these assets. A smooth information flow from concept through to completion and into maintenance was thus key for T5 and part of this related to the transfer of design data to their maintenance system Maximo through AIM.

Technical details

- 500 CAD users inducted
- 25 CAD Coordinators
- 12 supported CAD sites
- 15 CAD applications in use
- 24 large format printers
- 300 CAD helpdesk calls per month
- 1,000 gigabytes of design data





Asset integration

A particular goal of BAA's AMA initiative was and remains the efficient addition of asset information from a building's (or other asset's) completion into the BAA building maintenance system, Maximo.

With T5 design data being held in an object-based model it was clear that there could be major efficiencies gained if this data could be transferred through some automatic process rather than gathered from drawings and surveys as would normally be the case. From early in the project it was envisaged that this should be an intention and in 2001 a proof of concept project was undertaken by Excitech to examine how this could be achieved. This considered carefully how the relevant asset data could be created and held within the graphical data models for later retrieval and validation prior to being exported via a common data environment into Maximo for the ongoing operation and maintenance of T5. The benefits in time and cost saving were substantial and clear, as was the recognition that the data quality would be much better. Hence the development and implementation in 2002 of a software tool and process so that the design data included the necessary information ready for transfer and update during the completion period.

CAD management

Excitech's appointment as CAD Consultants to BAA for the T5 programme has been key to many aspects of the projects at both strategic and tactical levels. Setting out a new methodology for CAD within a project can be a significant task; but ensuring it works, is supported and delivers the expected benefits is the real measure for success.

Excitech's team, which grew to a maximum of nine full-time staff, were working with over 25 separate design teams. Absolutely essential to successful collaboration and the smooth running of the design aspects were the needs to educate and promote the requirements of BAA and the programme to each and every individual within all these teams. Handling the cultural issues, which always go with the implementation of new processes, techniques and methods was also both vital and sensitive.

As with any project there are risks where design teams overlap so coordination as to responsibilities was critical. Discussions were centred on what a group was doing (what are the deliverables to be), how they are undertaking this (the processes) and why (who should be doing this). Emphasis was placed on creating an environment of a single programme team no matter who employs them, what their design discipline, where they are based or which project they are working on.

Excitech's team also supported design data quality, collaboration and productivity by being active



in each of the following areas

- Object and design content
- CAD standards and compliance
- CAD skills assessment
- Training
- Model management
- Storage management
- Application design and development
- CAD desktop implementation
- Technical support

As with other projects intensive training programmes attempting to teach everyone everything were not used. Instead the technique has been to

- Identify what expertise is needed for each team and individual
- Introduce object technology without the end user being aware of the technicalities and extra data within the objects
- Establish an efficient process for production of the particular deliverables
- Provide central expertise to kick-start and encourage teams
- "CAD roadshows" to improve awareness
- Regular "tips and tricks" guides
- Workshops
- Regular CAD Coordinator Meetings

The legacy

The evidence for the success of the T5 Programme is clear; it has achieved its major design and construction goals on time and on budget. As a gateway between the UK and the world, though, it is more than just an airport terminal. T5 has been one of the world's largest construction programmes that has adopted innovative design technologies – and it made that choice a decade ago. That the basic concept and its implementation were able to be sustained and developed over this long period through changes in the design technology systems and changes in design requirements is testament to the excellence of the decisions, processes and people involved.

However, the real legacy may not be the Terminal 5 programme as represented at Heathrow. The real legacy may be how the programme has shown and continues to show the way for other construction projects — not just for BAA but for the whole construction industry. As Peter Rebbeck, the former Technology Solutions Manager at BAA says: "At the outset we were really pushing the technology to its limits but as we have rolled out T5, software solutions capable of supporting these 3D design methodologies have increasingly come on line."

But does this design technology bring benefits? Dr Chris Millard, Head of Engineering for the T5 Programme and Head of Technology for BAA Capital Projects is certain when he states that: "If we had not used such an approach we would not have built the terminal as quickly and efficiently as we did."

His enthusiasm is shared by others who have worked on the project including Mervyn Richards, who was CAD Technology Manager at BAA framework partner Laing O'Rourke. With BAA's agreement he used T5 project documentation to work within the UK government sponsored AVANTI project, which was investigating ways to improve collaboration within the construction industry. AVANTI then implemented similar processes in other projects to analyse and quantify their success. "The conclusion was that the approach does work, it has great advantages and has enabled everyone in the supply chain to save money," says Richards, "and the benefits extend far beyond the project end deliverable."

The principles of the AVANTI approach have now been enshrined in the BS1192:2007 data management standard – the code of practice for collaborative production of architectural, engineering and construction information.

It worked for T5 and has been seen to work elsewhere, so what is holding back this design technology's more widespread adoption? Perhaps the best answer comes from BAA, to quote Chris Millard: "The problem in implementing this model is, to a large extent, now a people problem. The difficulty is teaching people to use the software and educating clients about the savings that can be made. The secret is to get a nucleus of workers working in this way as this will encourage adoption amongst other project staff."

Conclusion

With the T5 Programme, BAA has demonstrated a visionary approach to achieving its goals through innovation. Through the design technology, processes and expertise provided, Excitech is proud to have delivered practical support to BAA in its goals for T5 by delivering ground-breaking but effective solutions, ensuring design productivity, implementing and supporting the processes and ultimately by providing a solid return on the investment BAA has made in this project for now and for the future.

The fact that such technologies for design are becoming more and more widely adopted is excellent news for all in the industry and the publication of BS1192:2007 adds a formal "stamp of approval".

This article originally appeared in the Design Productivity Journal (DPJ).

Project Facts

- T5 on its own is equivalent in size to the complete London Gatwick site
- T5A — 396m x 176m by 40m high
- T5B — 442m x 52m by 19.5 high
- 260 hectares
- 30 million passengers p.a.
- 60 aircraft stands
- Control tower 87m
- 18km Baggage system
- 1.3km, 8.1m diameter airside road tunnel
- 4.1km, 2.9m diameter storm water outfall tunnel
- 6km of twin rivers diversion
- 4,000 space multi-storey car park
- 70% of the construction is below the surface



Levitt Bernstein Associates first used Revit Architecture on Bermondsey Spa, a prestigious project with multiple phases.

Seamless transition – or a major headache?

If the advantages of BIM-based Revit software are so overwhelming, why hasn't every architectural or engineering practice migrated? **Chris Hobbs** of CADline outlines the plusses and pitfalls of migration.

As most building industry professionals agree, the latest BIM-based 3D design software is light years ahead of its outdated 2D forerunner. With packages like Revit Architecture and Revit Structure, you get timely feedback on project design, scope, schedules and budgets, thus enhancing your design efforts and gaining insights into the design process much earlier.

Sustainability in design – increasingly a built environment pre-requisite – can be driven through the accurate BIM-based analysis of materials, sun position and solar effects throughout the design process. BIM also provides vital data for clash detection, construction analysis and even fabrication and helps avoid costly design mistakes and wasted efforts. Indeed, it's hard not to conclude that any future-focused practice not using BIM-based software will soon be left behind.

If most of this is acknowledged by the building industry, why then is 3D design software like Revit not more universally adopted?

Many designers put off the decision to migrate because they're either too busy to think about it or they're unwilling to embrace and implement the cultural changes it will impose. Often, it is simply fear of the unknown; paradoxically, the AEC community is at once cutting-edge and highly traditional.

Resellers are often regarded as the font of all software knowledge but they don't always make it clear what implementation entails or discuss with their clients what they can do to ensure the transition runs smoothly.

Whether it is the fault of the resellers, the ethos of the design firm or the CAD managers within those firms, some practices complete migration more quickly than others and see an early ROI. Furthermore, most of these organisations don't know how they survived before it.

Strategic planning

For many that have embraced Revit, the key to successful implementation was a carefully-planned training programme. Perceived skills shortages have impeded migration for many practices; the prevailing thought being that training will be too costly to implement or take too long and involve staff downtime or even that it won't be sufficiently effective.

One of the major pitfalls to successful migration is a client that buys the product but not the training. They will never do as well as someone who has invested the money and strategic planning resources in getting their staff properly trained. A good reseller will conduct initial 'how to use the product' training on Revit and then hand-hold for however often it is needed to run the project effectively.

The other thing that a CAD manager needs to do is ensure that the IT infrastructure is set up correctly. Revit relies heavily on networking and needs to have decent network configuration specifically dedicated to it.

This was the experience of structural design consultants, Price & Myers, which adopted Revit

Structure around 18 months ago. Recognising that the move towards BIM needed to be carefully managed, senior CAD technician, Koal Bhogal, created a CAD Development Group comprised of representatives from each department. This team is responsible for maintaining standards and making decisions as to when new versions will be implemented.

"We're gradually developing best practices – and the good thing is, it's actually motivating staff. They are really glad to be learning something new and keeping up their skills," he says.

Price & Myers project co-ordinator, Jack Walshe, originally came across Revit Structure when it was first released. "BIM and object-orientated graphic design was all very experimental then and did not, at first, appear to be a viable alternative to AutoCAD," he said. In the last year, Price & Myers has used Revit on a large and complex refurbishment project, where there was a need to completely re-model existing buildings and create a phased demolition and final model.

"Initially we had some minor problems, with users in different office locations, but now we have refined our approach to breaking down the model into useable data sets," he says. "Using the latest version of Revit, the team was able to override objects within view and easily maintain multi-sheet floor plans with view-dependant options."

Walshe is first to point out that working in this way requires a shift in expectations. "Using Revit requires that more useable information is produced at an earlier stage. Initially, the lead time for this is greater, but as Revit keeps project drawings continually up to date and co-ordinated, we save more time the further we progress."

"Using Revit requires that more useable information is produced at an earlier stage. Initially, the lead time for this is greater, but as Revit keeps project drawings continually up to date and co-ordinated, we save more time the further we progress."

Jack Walshe, ***Price & Myers project co-ordinator***

Another major area to think about when migrating to new software is timing. If a firm is new to any software – and Revit in particular, given the shift in working culture it necessarily entails – it should never be on a new and highly-complex project or one with a tight deadline. Pick your project carefully.

One of the early projects on which Levitt Bernstein Associates first used Revit Architecture was Bermondsey Spa. Well known for its award-winning projects in urban renewal, Levitt Bernstein created the huge regeneration masterplan that is Southwark's Bermondsey Spa using Revit.

As Levitt Bernstein's Dylan Murdey-Green explained, it was a big project but a good one to start with because it consisted of multiple phases and the benefit was that everything is held in Revit's underlying data so they can move on to subsequent phases quickly and easily.

One common feature amongst the successful early adopters of Revit software is that most of them were spearheaded by real enthusiasts and therein lies a lesson: ensure the first users in the company are the enthusiasts who really want to use it – they will infect others. If someone has spent the last 25 years using CAD, they're often not interested in adopting a new modus operandi, no matter how great the underlying product. But enthusiasm and success amongst early users will breed further success.

Early enthusiasm on one Levitt Bernstein project provided a light bulb moment early in their use of Revit, as Murdey-Green goes on to explain: "On one occasion we sent plans off to a QS to get the quantities costed. It took about two weeks and when they came back, we weren't convinced, something seemed wrong. Using Revit, we clicked a few buttons and in a matter of an hour or so, we got our own quantities and costs calculated and sent them back to the QS – they were absolutely stunned, as were the project architects. The client was also overjoyed that we could keep things so on track. It gives the power back to the architects to control these projects."

As many AEC practices are beginning to realise, when mastered, Revit software actually puts the fun back into design, and has important implications around collaborating through the supply chain.

As Price Myer's Jack Walshe told us recently: "With the structural solutions we've used, until Revit Structure, there's always been something missing. But it's been a case of so far, so good – it appears to answer many of the questions still dogging other solutions." ***www.cadline.co.uk***

Tekla Structures v14

Tekla Structures is an end-to-end structural BIM solution providing a dedicated 3D modelling environment for conceptual design, engineering, round trip analysis, detailing and beyond. **Greg Corke** takes a closer look at the latest release, version 14.

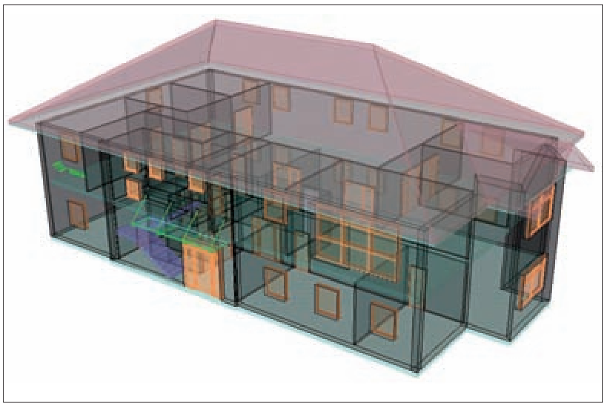
BIM (Building Information Modelling) is at a tipping point in the architectural sector with increased adoption of products like Revit, Bentley Architecture, and ArchiCAD. But while architects are only starting to realise the benefits of intelligent object-based design, their colleagues in the structural sector have been reaping the rewards for much longer.

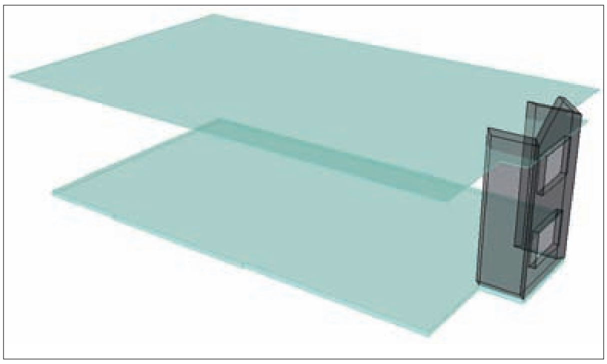
Virtually all steel fabricators rely on intelligent 3D models to produce accurate Bills of Materials (BOMs) and cutting lists / NC code, while consultant engineers exploit 3D to design and analyse increasingly complex structures. But getting the two disciplines to work together with the same 3D data is another matter entirely and one of the underlying ambitions for structural software developer, Tekla through its Tekla Structures product.

Structural BIM, as Tekla defines it, covers the entire structural design process from conceptual design to detailing, fabrication and erection of all multi material elements. However, it's not just about the structural engineer passing on a model to the steel fabricator, but providing a single design environment in which concrete, steel and even timber can happily co-exist.

Tekla is a Finnish company by descent and its background lies in structural steel detailing through a product called XSteel, one of the first commercially successful 3D detailing applications on the market. In 2004 the company combined XSteel with its Xengineer product, a parametric 3D modelling package for engineers, and Tekla Structures was born.

Like Revit Structure from Autodesk, Tekla Structures is a structural BIM application, which enables engineers to create intelligent physical and

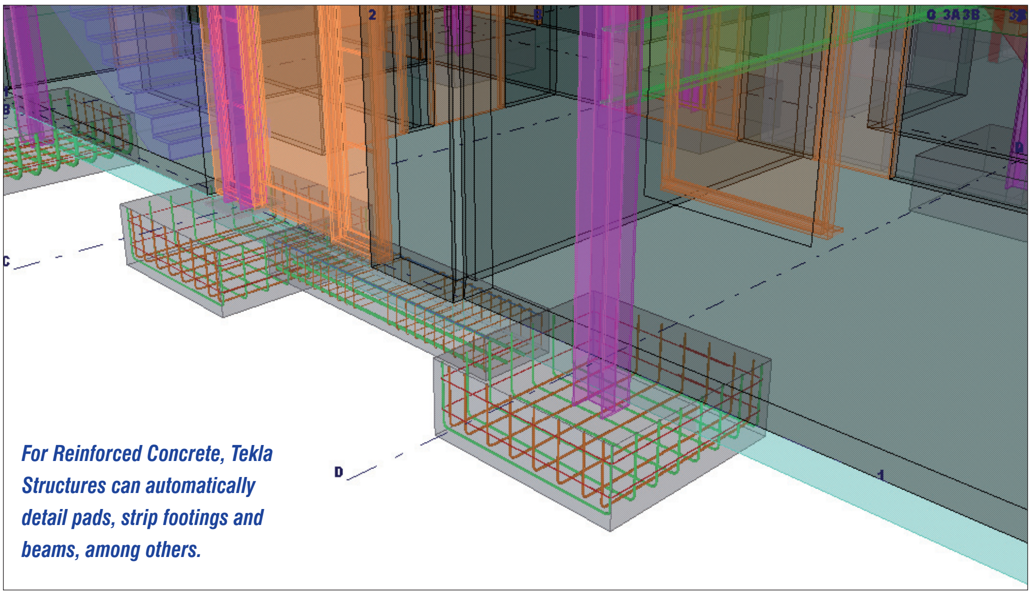




analytical structural models for design. However, it also offers a highly capable steel detailing element, combined with precast concrete detailing, reinforced concrete detailing, and into the realms of project management.

Tekla Structures is used in over 80 countries worldwide on a huge range of projects ranging from Wembley Stadium and the Beijing Olympic Stadium to New York's Freedom Tower and Leadenhall in the City of London. Its ability to model complex structures

To help with the management of referenced 3D models and their revisions Tekla Structures features a neat utility that compares and shows only the changed objects.



For Reinforced Concrete, Tekla Structures can automatically detail pads, strip footings and beams, among others.

whilst keeping the file size small is a particular draw for the product. For example, the model for Wembley Stadium was only 70MB in size.

The system is modular and the number of options available is a little overwhelming, but this means users can tailor the application for many specific roles without shelling out for the entire software package if they are only interested in certain elements. There are seven configurations in total: Full Detailing, Steel Detailing, Precast Concrete Detailing, Reinforced Concrete Detailing, Standard Design (will be called Engineering in 14.1), Project Manager, and Viewer.

Design and modelling

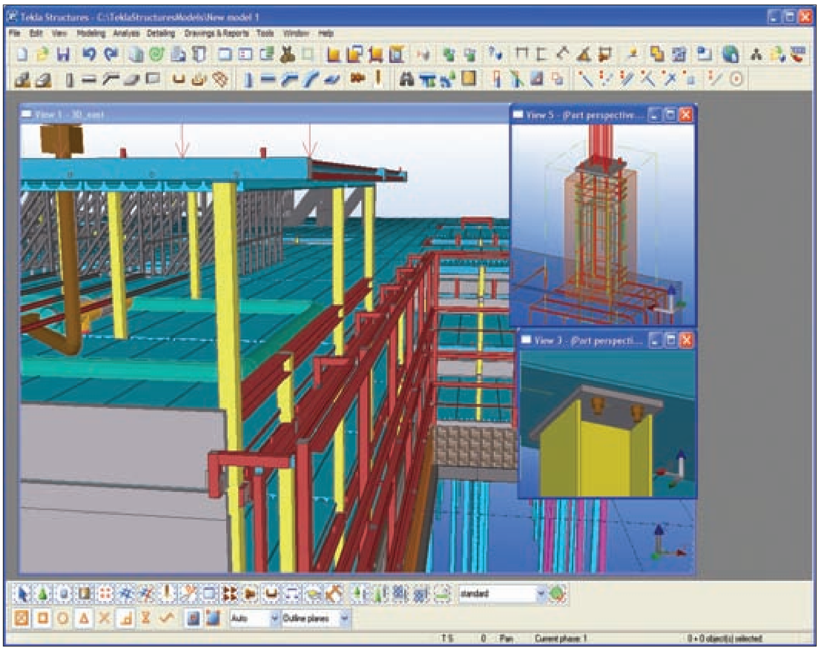
'Standard design' is the module of choice for consulting engineers and the starting point for any structural design project in Tekla Structures. It provides all the tools required to build up a structural BIM model and offers 'round trip' analysis links to many of the leading structural analysis applications.

Tekla Structures models can be built from scratch or based on referenced architectural or other 2D drawings or 3D models (DWG, DGN, IFC, etc). These 3D models can be made transparent to improve clarity, clip planes can also be used to expose elements through sections and clash detection carried out between models. As architectural models are continually changing there is a neat utility that enables users to compare two referenced 3D models and show only the changed objects.

Grids are essential, regardless of whether referenced data is being used or not. These are even more important in Tekla Structures than in other structural applications as they not only provide reference points for structural components, but can be used to generate different named views for each of its viewports. For example, named views can be created for specific sections through a structure and it can also be used to define plan views at specific elevations or floor heights. This is likely to take a little getting used to but it's an extremely powerful capability.

Pretty much anything can be modelled in Tekla Structures: beams, columns, slabs, walls. These can be chosen from an extensive library of industry standard components and include standard UK & European sections, cold rolled, and precast concrete, but custom profiles and freeform components can also be modelled. This makes Tekla Structures particularly attractive for use on complex projects.

In a typical workflow components are laid down onto the grid, offset, or snapped to construction lines or reference elements. Users can work in 2D or 3D at



The new Tekla Structures V14 interface, which features a workflow based menu structure.

the same time and even start in one view and finish in another – it is that flexible.

Component properties, such as size, length, and material, can be defined prior to modelling or edited at a later date. Group edits are easy and users can choose which attributes to change. For example, it is possible to change the length of a group of beams without changing their individual shape or sizes. All the usual copy, move, and array commands are available to help users quickly build up the structure. There are very few limits.

Components do not have the same level of intelligence as they do in other BIM applications. For example, a beam does not automatically trim when it is attached to a column. However, there is a number of different ways to build in connectivity between components, so if a beam moves or changes shape the column adapts accordingly.

With more control over how components interact, Tekla Structures offers much greater modelling freedom. The downside is that users will have to invest more time to ensure that the geometry behaves how it should when edits are made.

Tekla Structures uses a central database to store all of its data. At the conceptual stages of design, this means several engineers can work in the same environment without having to break the model down into chunks. As data is saved a prompt appears to enter an optional revision comment explaining the changes. At the same time, users are notified of changes made by other engineers. Working in this way a full audit trail is made available for the project, but care still needs to be taken to co-ordinate work. Tekla Structures does not have a dedicated mechanism to enable engineers to communicate in real time. Instead, use of applications like Instant Messenger is common.

Steel detailing is a major strength of the system and it includes hundreds of different types of 3D parametric connections. These can be generated automatically through customisable rules and are based on Green Book codes. They can be adapted by the user and parametric and non-parametric connections can also be created from scratch and saved in a custom library. A number of parametric custom components, such as Curtain Walling, Staircases, Trusses, and Precast Floors, are also included.

Tekla Structures includes a comprehensive customisable library of components and joints.

A new look

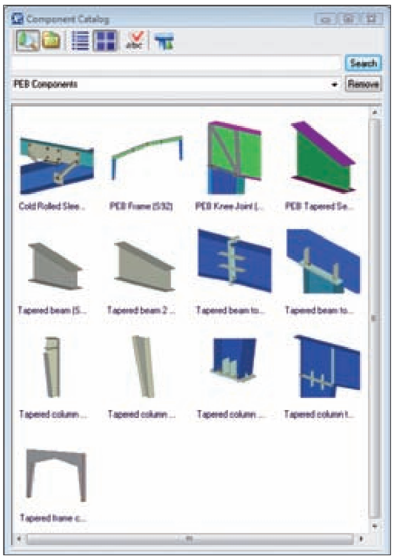
For the latest Version 14 release, Tekla Structures has received a major overhaul to its user interface. This followed a series of usability studies, which highlighted a number of issues with the previous system, particularly for new users. Version 14 includes new menus, which are structured to follow the users' workflow (modelling, analysis, detailing, output) and command names that are much easier to understand.

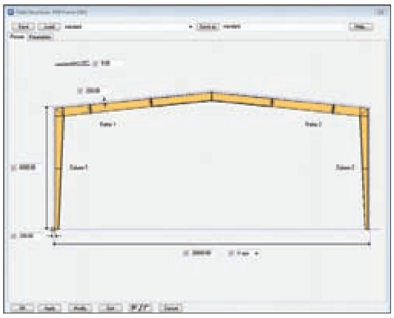
Analysis

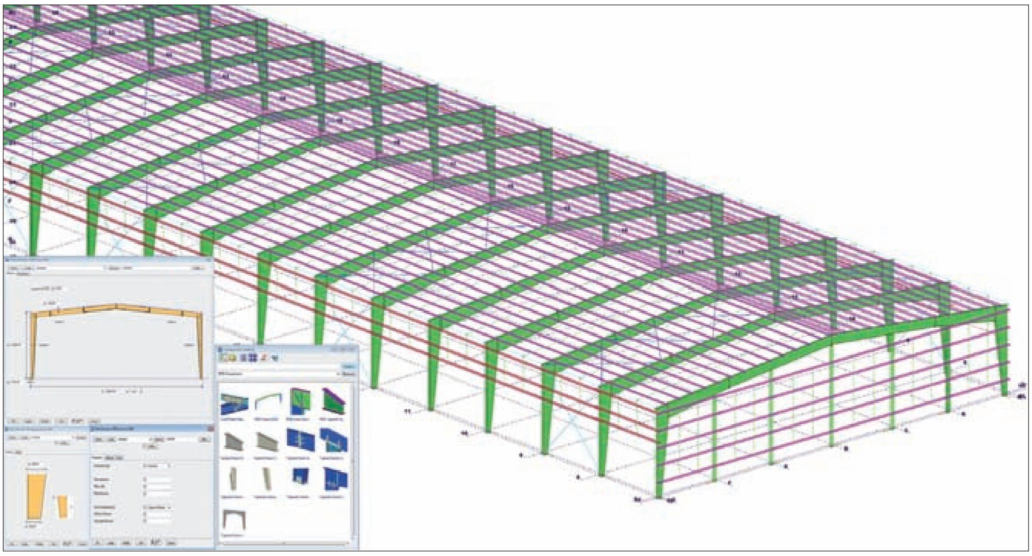
Tekla's BIM ideology of sharing structural data throughout all stages of the design process is also applied to analysis. Round trip analysis is provided for a number of leading applications, including Robot, STAAD, S-Frame, and SAP2000. Engineers can export the BIM model from Tekla Structures, analyse the structure in a dedicated analysis application, tweak the design as necessary, then bring it back into Tekla Structures and accept or reject design changes (individually or globally). For analysis applications where direct links are not available (such as RAM) Tekla Structures also supports the CIS/2 and IFC interchange standards. In this case design changes need to be manually updated in the Tekla Structures model.

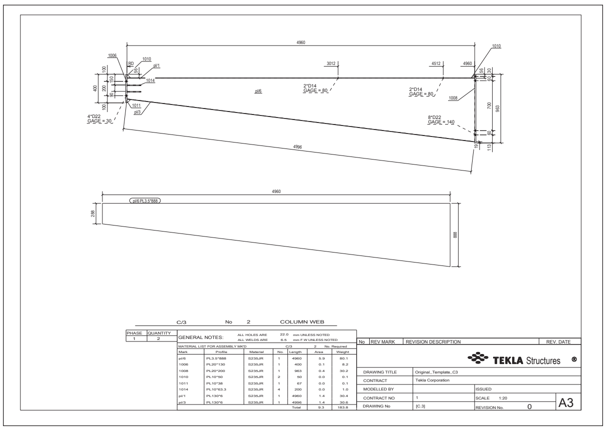
Forces and load conditions can also be assigned inside Tekla Structures and taken into the analysis package. This streamlines workflow, particularly if there are multiple design iterations. However, many engineers still prefer to manage loading, and instead load cases inside an analysis application.

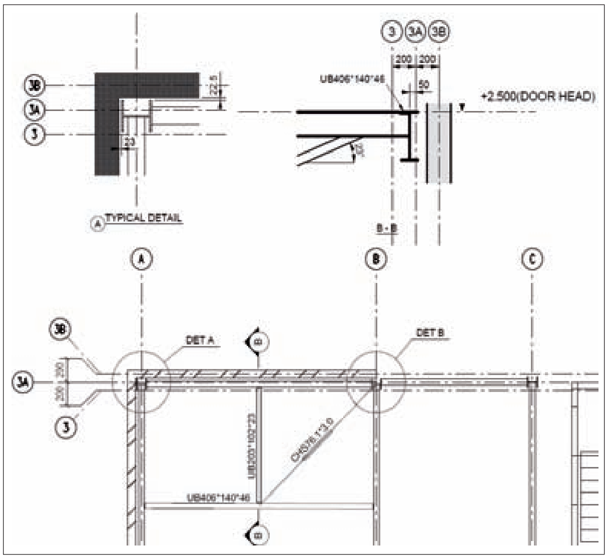
Structural analyses requires a dedicated analytical











With a central database containing all the structural information, drawings are produced as 'snapshots' of the 3D model.

model. Unlike Revit Structure, which automatically builds an analytical model in the background as the physical model is built, analytical models are created as and when required. The engineer can create multiple models for different types of analysis (steel frame, beam design, concrete slabs) and can define exactly which components are included in each. This means the best analysis application can be used for the job at hand.

Inside Tekla Structures Analytical models can be viewed alongside the physical model and the engineer is afforded much control over the positions of nodes (the top, bottom or neutral axis of a beam), the type of joint (fixed, pin) and the level of fixing. Additional nodes can be added if required and structural elements can also be combined as one affording much flexibility.

Drawing and reports

With a central database containing all the structural information, drawings are produced as 'snapshots' of the 3D model. If the model is amended, these changes are automatically highlighted in the drawing with a revision cloud. These remain until the drawing is re-issued.

Details and sections can be created from other views and if they are placed on another drawing sheet they are automatically referenced in the original drawing.

When inside a drawing it is not possible to move beams, columns, etc so the physical model can't be edited in this way. However, CAD tools can be used to add lines and text to drawings.

Drawings can be based on templates with title blocks automatically populated with project information and anything in the model can be scheduled. Dimensioning is automated, as can be the creation of close-up views of details.

The engineer is afforded complete control over how each detail and component is displayed but if something has not been modelled to the required level of detail, drawings can also be augmented with 'dumb' 2D details, though these are not linked to the project model.

In addition to drawings and schedules, Tekla Structures can generate a wide variety of reports in HTML, .XLS and .TXT formats, based on the model as a whole or for individual components. These can also be used to check the model for accuracy before it goes downstream. For example, an engineer could use a report to instantly see if columns are on a grid and then automatically zoom to the problem area.

CNC code and steel management

For CNC (Computer Numeric Control) code generation, which is used to drive shop machinery tools to fabricate steelwork, the system supports DSTV standards. In addition, Tekla Structures supports FICEP's scribing technology, which scribes directly onto steel to indicate the required layout locations and aid in construction on site. Part marking, layout lines or welding symbols can all be added.

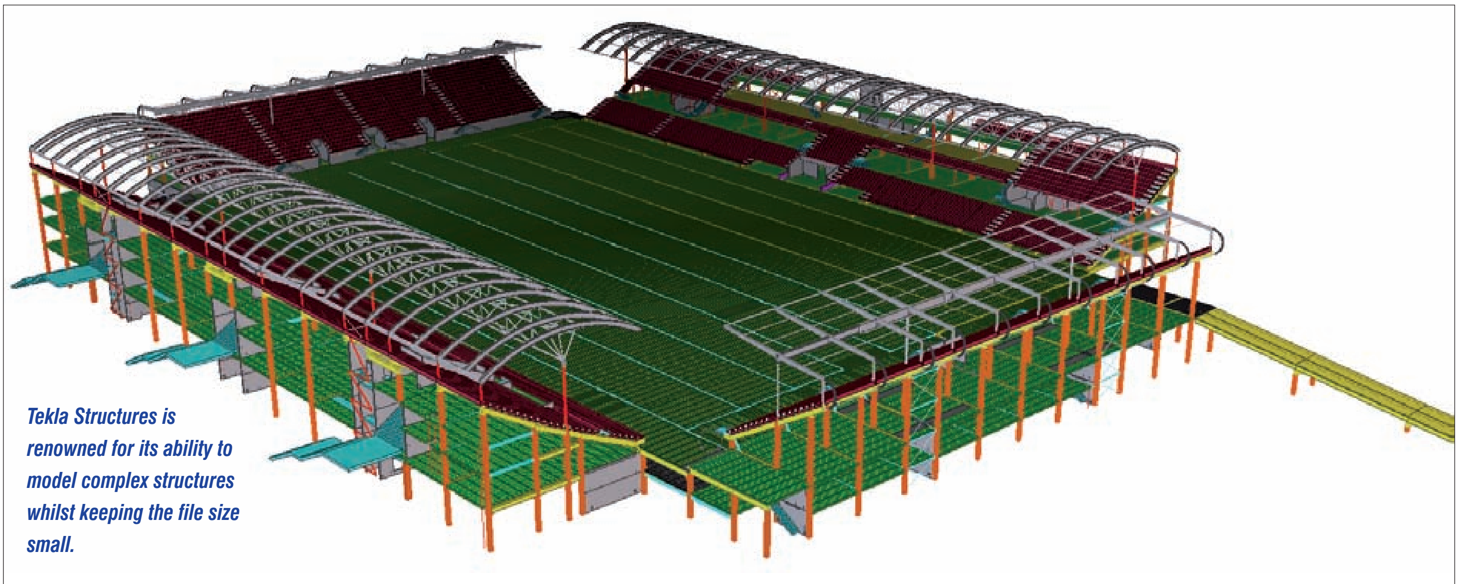
Tekla also works closely with Vela Systems to support its RFID (Radio Frequency IDentification) technology. This enables all components to be tracked and managed from shop to site. This information can be visualised in the model environment or over the web using the free web view.

Concrete detailing

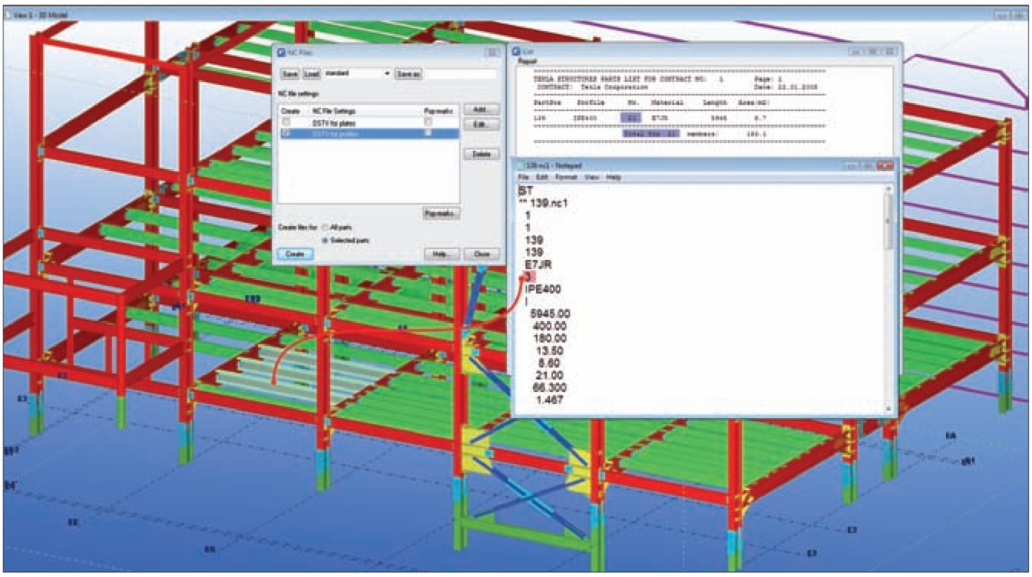
While Tekla's strength historically lies in steel, its

Tekla Structures Viewer

To extend the reach of data to all project stakeholders, Tekla offers a dedicated Viewer, which means anyone can follow the progress of the model as it is being built. Users can fly through the entire model, interrogate it for information on structural elements (weight, steel grade), measure and check lengths, and open, edit and print drawings. It can also be used to visualise the structural model together with HVAC, M&E, plant or architectural models.



Tekla Structures is renowned for its ability to model complex structures whilst keeping the file size small.



For NC code generation the system supports DSTV standards.



Tekla Structures was used on the Wembley Stadium project, which used 215,000 tonnes of concrete and 24,000 tonnes of steel.
© Anthony King - Fotolia.com

Structures product also includes 3D detailing tools for reinforced and pre-cast concrete. Whereas 3D steel detailing is commonplace, RC detailing has largely remained a 2D practice so doing everything in a 3D environment is an interesting proposition. As with steel in Tekla Structures, the modelling process is flexible and the detailer simply lays down bars with the system automatically recognising shape code and positioning according to pre-defined cover thickness. Attributes such as grade, size, and number of hooks, are all controlled via dialogues.

The system also features a number of standard objects and can automatically detail pads, strip footings and beams, among others. Detailing macros are provided for wall panels, windows and other details.

A drawing wizard is included for producing reinforcement drawings, formwork drawings and rebar schedules, and NC code can also be generated for bars.

Conclusion

Tekla Structures is a vast product that covers the entire structural design process in a single environment. It enables a single BIM model to be used from the conceptual stages right through to fabrication and beyond and its ability to re-use data through the design, analysis and detailing phases and model in steel, concrete and timber is somewhat unique in the industry. While other structural BIM systems offer capable modelling and round trip analysis, they do not provide such powerful tools for the detailing phase, a capability on which Tekla Structures was founded.

Tekla Structures scores highly in structural design, but it loses out when it comes to sharing data with other AEC disciplines. While it supports the capable IFC standards, there is still no substitute for sharing data with architects and building services engineers in native formats, such as Revit and MicroStation, and this will become increasingly important in the coming years as BIM grows.

In terms of modelling the product is extremely powerful and users only need to look at the range of structures that have incorporated Tekla Structures to see how adept it is with dealing with complex forms. The downside of this modelling freedom is that structural elements are not automatically constrained, so a disciplined approach to modelling is essential to ensure connectivity is maintained. Without this users are missing out on the major benefits of structural BIM, such as adaptability, accurate drawings, BOMs and cutting lists.

Delivering such a powerful system for structural design is a major achievement for Tekla. The software does an excellent job of bridging the gap between design and fabrication and through its single environment provides the perfect conduit for data to flow smoothly from engineer to detailer. Most importantly, though, it has the potential to simplify the management of an often fragmented process, leading to enhanced collaboration, better designs, reduced times, and of course lower costs.

www.tekla.com





CADS RC spreads its wings

CADS is a global developer of structural software with a major focus on RC detailing. **Greg Corke** caught up with Ian Chambers, International Sales and Marketing Director, CADS, to talk about the company's increasing global reach, the impact of the credit crunch and its unique RC detailing service.

Greg Corke: CADS RC has been spreading its wings in recent months adding support for South African and Indian detailing standards. What are the driving forces behind these latest additions and do you have plans to add other standards?

Ian Chambers: South Africa is a lucrative market for us with some well-established customers, such as Arcus Gibb, which is using CADS RC and some of our other products, including our 3D detailing solution for structural steelwork, Advance Steel.

South Africa has traditionally looked to the British code, from which its own SABS code has developed as well as being a destination for many British engineers. It is also growing fast, especially with the upcoming World Cup in 2010. So in 2007, after some careful evaluation, we chose reseller partner CAE Solutions in Johannesburg, a well-established Autodesk reseller.

In line with this move we 'refreshed' CADS RC by updating its macros for stairs, foundations, etc. and added support for the latest South African Detailing Code. We gave this upgrade free to all maintained customers.

CAE Solutions is also offering our global RC Detailing Service to their customers. This results in a mature package of software, training and services for South African engineers and construction companies, something that we intend to repeat with additional partners across Africa in the coming months

Our operation in India has traditionally sold CADS RC to Indian-based offices of UK consultancies or offshore detailing operations. However, the growth of India's construction market led us to see further opportunities to support detailing of local projects as well. For this we needed to ensure CADS RC was fully-compliant with Indian standards and therefore CADS RC India was born.

This is a new product based on CADS RC version 9 and was released early in 2008. CADS-RC India supports detailing to Indian standard IS 2502:1963 (Reaffirmed 1990 and 1999). It also includes a number of bar shapes to meet the extra requirements for seismic detailing to IS 13920:1993 Edition 1.2 (2002-03).

We have also increased our sales and support presence in India with offices and resellers in Chennai, Delhi, Mumbai, Calcutta, Hyderabad, Bangalore and Sri Lanka. CADS RC India has really taken off and we are planning further investments.

In addition to India and South Africa, CADS RC supports British and North American detailing codes. The North American code is covered by RebarCAD, which we launched in the US and Canada in the mid 1990s.

In terms of future additional codes the obvious new standard is the Eurocode. To this end CADS has several parallel developments taking place that will ensure our analysis, design and detailing software is compatible as we move towards the 2010 deadline. We also continue to work closely with North American


Reduce Errors, Increase Productivity
and Improve Communication with
Autodesk Revit
The AEC industry is changing, and changing fast. Building Information Modelling is becoming a major new platform in finding solutions for today's design challenges such as sustainability, construction waste and multi-discipline coordination.
New Tools for Resolving Everyday Challenges
Computer Aided Design is no longer just an electronic drawing board - digital modelling is evolving as an essential tool in providing new levels of design productivity and effectiveness. Whatever the project, new issues such as environmental legislation, services coordination, tighter cost control and greater planning restrictions can now be resolved by simulating the project prior to construction, saving a great deal of time, money and risk. Critically, Revit also provides a quicker and smarter way of generating traditional plans, elevations and sections in a fraction of the time of 2D CAD.
Expertise When You Need It
As a leading Autodesk UK partner, Cadpoint offers you proven expertise in Revit implementation and support. We want to understand your design process and offer advice on how to drive best practice and increased return on technology investment, both now and into the future.
Sign Up for a Free Consultation and Find Out what Revit could do for your Business
Register at www.cadpoint.co.uk/revit or call 01344 751300
Autodesk Value Added Reseller
Autodesk Authorised Training Centre
CADPOINT
solve | create | innovate
AutoCAD and AutoCAD LT Users
Move up to Revit from just £1150.00 + vat
Save upgrade costs by moving to AutoCAD Revit Suite - this allows you to maintain your existing project data using AutoCAD whilst implementing Revit at a pace to suit your organisation. Revit Suite is the only BIM solution to integrate a full copy of AutoCAD - straight out of the box. Offer ends 17/10/2008
(Price shown is AutoCAD Revit Suite 2009 SLM upgrade from full AutoCAD 2009 when purchased with subscription before 17/10/2008)

rebar fabricators on their specific bar shape requirements.

GC: Autodesk's Revit Structure now includes a dedicated RC detailing solution called AutoCAD Structural detailing. As CADS is also a reseller of Revit Structure how has this affected the way you position CADS RC?

IC: We view Revit Structure as a major opportunity for UK engineering consultancies to realise the BIM 'vision'. Initially, we envisaged the links with analysis software tools such as Scia Engineer as the key message, but further investigation and feedback from customers has shown a real mix of experiences and ways of working. From using Revit Structure on its own as a modelling tool, linking to analysis tools or even using it to generate drawings ready to be detailed in CADS RC, Revit Structure has much to offer. However, we find that it may suit some consultancies but not others, depending on their requirements and existing software mix. We are happy to provide advice on all options we are able to sell.

GC: Do you find that new customers of CADS RC are moving over from other dedicated RC detailing solutions, or is 'vanilla' AutoCAD still strong and, if so, why do you think this is?

IC: Of course users of 'vanilla' AutoCAD are still out there, but many of them will be dissatisfied with it as a dedicated detailing tool.

We have found that AutoCAD users already fail to exploit the AutoCAD features they have. In response, CADS has seen its role as building on these features in a way that is relevant to RC detailers and rebar fabricators.

Several million tonnes of rebar reinforcement is detailed every year by users of CADS RC and RebarCAD. Fundamentally it is about time and cost saving. By exploiting AutoCAD's paper space and layout features CADS RC v9 is able to produce multiple drawings and bar schedules from a single DWG file. Features such as Viewport Manager help detailing users unlock the potential of AutoCAD. Viewport Manager greatly simplifies the creation and editing of AutoCAD Layouts and viewports to achieve the required plotted page. Once users have defined viewports and their associated scales then CADS-VPM will automatically apply the required scale to CADS RC v9 details as they are created or manipulated. VPM will automatically rescale details when moved between viewports.

GC: One of the major features of CADS RC 9.0 is a completely redesigned scheduling interface. How has this impacted the workflows of your customers?

IC: CADS RC v9 is the first part of the complete redesign of CADS RC, which has been designed to combine new features with intelligent but simple presentation.

The new bar scheduling interface has been completely redesigned to offer improved usability and clarity. With version 9 an improved working space makes organising, categorising and formatting rebar data much easier.

Users can interact directly with the bar schedule to customise layouts. Formatting the schedule, reports templates and company standards is simple. Delivery of drawings and schedules can be achieved in various ways and revision management ensures all changes are tracked and marked automatically. The latest release of CADS RC v9.03 has taken things even further with a new command ribbon that provides an alternative to the traditional CADS RC interface. It is up to the user whether they switch this on or not so choice is not an issue.

Some breaking news is that we have also completed our latest work on tool palettes for CADS RC. This is a major new feature, which provides an alternative way of working to the traditional dialogue boxes.

GC: For a software developer CADS is unique insofar as you also offer an RC detailing service for your main markets of Dubai (UAE), UK, USA & Canada. I would suspect business in Dubai is very healthy, but how has the global economic climate affected your other serviced countries, and what about growth economies like India and China?

IC: Reputation is everything and working with the developer of CADS RC offers enormous advantages over using other outsourced detailing operations. For starters you know we understand the software, but we also have a fundamental understanding of detailing as a process.

UAE has always been a happy hunting ground for us, with substantial projects at Jumeirah Beach Residences, Dubai Festival City and the Dubai Motor City. We also have several spectacular projects in hand in Abu Dhabi. We envisage further growth there and with local detailing teams, software sales and support hope to develop this market still further to encompass other Gulf states.

The so-called 'credit crunch' has affected us in complex ways. Whilst software sales take longer in the UK, growth is still apparent in other markets such as India and the UAE for various reasons. Maybe the funding of their projects, a particular Government's will to fuel growth or the latent demand ensure many markets remain relatively unaffected. But having a detailing service as well as software provides our customers with options and we have a broader and more robust offering when times get tougher.

The emerging economies are growing at phenomenal rates but how they service that growth, whether through local purchasing, contracting Western consultancies or utilising outsourced operations varies.

We find that once major clients have used our detailing service for a project in one region it often leads to work in other parts of the world, such as the recently completed Larnaca Airport in Cyprus. We welcome projects big and small and see having a diverse mix of clients and markets as absolutely essential for a healthy and expanding business.

www.cadsrc.com
www.rcdetailing.com



Large International Project - Larnaca Airport, Cyprus – RC Detailing for Meinhardt (UK) Limited

"Several million tonnes of rebar reinforcement is detailed every year by users of CADS RC and RebarCAD. Fundamentally it is about time and cost saving. By exploiting AutoCAD's paper space and layout features CADS RC v9 is able to produce multiple drawings and bar schedules from a single DWG file.

Creating a "Water Cube"

Arup wins gold in Olympic swimming centre design

Securing the design contract for the National Swimming Centre for the Beijing 2008 Olympics was a task worthy of gold medal distinction. But with the help of MicroStation and Bentley Structural software, Arup and architectural firm PTW of Sydney, Australia, together with CSCEC from Beijing and Shenzhen, beat ten qualifiers for this prestigious, world-class project.

Arup's 'Water Cube' design was based on a natural pattern of organic cells and the formation of soap bubbles. Contained within the centre's blue bubble walls are the pools for the Olympic swimming and diving competitions, along with seating for 17,000 spectators.

The project had two stages: competition and design. During the competition stage, a large portion of the design was created, but the main task was to develop a method that would enable Arup to produce a 3D model and drawings in the shortest time possible prior to the presentation. During the second stage, Arup incorporated the final features, calculations, and design that would complete the project.

Solution to a daunting proposal

The building structure is a 3D Vierendeel space frame 175 metres on each side and 35 metres high, based on a geometric cell made up of 12 pentagons and two hexagons, which is repeatable in 3D without leaving any empty spaces. Covering this frame are the translucent bubbles, or ETFE pillows.

Using Bentley Structural and MicroStation TriForma, Arup generated a 3D array of the cell, rotated it about two axes, and then sculpted the building. The cut surface planes of the remaining elements form the flanges of the composite structure, while the internal elements form the webs.

Stuart Bull, Arup senior 3D technician, described the modelling and documentation process as a "daunting proposal". Arup created a 3D centreline wire-frame and exported it to a structural analysis program for engineering. The analysed model was output to a text file containing geometric and structural member design data.

Next, Arup wrote a MicroStation VBA routine that used the text file to create a complete 3D model of the steel structure. By enabling MicroStation Development Language (MDL) functions, the model could be created as surfaces, solids, or structural elements as appropriate.

"The ability to use the VBA scripts to create our geometry, which gave us the link from the engineering and analysis model to our working 3D CAD model, was very important," Bull said. With more than 22,000 beams and 12,000 nodes in the structure, the automation by the VBA routine saved Arup months of manual 3D modelling.

As part of the competition, Arup, PTW, and CSCEC also had to provide a physical model of its design. This was done by saving a copy of the 3D structural model as a stereolithography (STL) file to create a rapid prototype model.

The physical model was created from a process called SLA, in which liquid epoxy resin is solidified by a laser following the STL file information to make a semi-transparent plastic. This model was presented in the final competition stages.

Factors for success

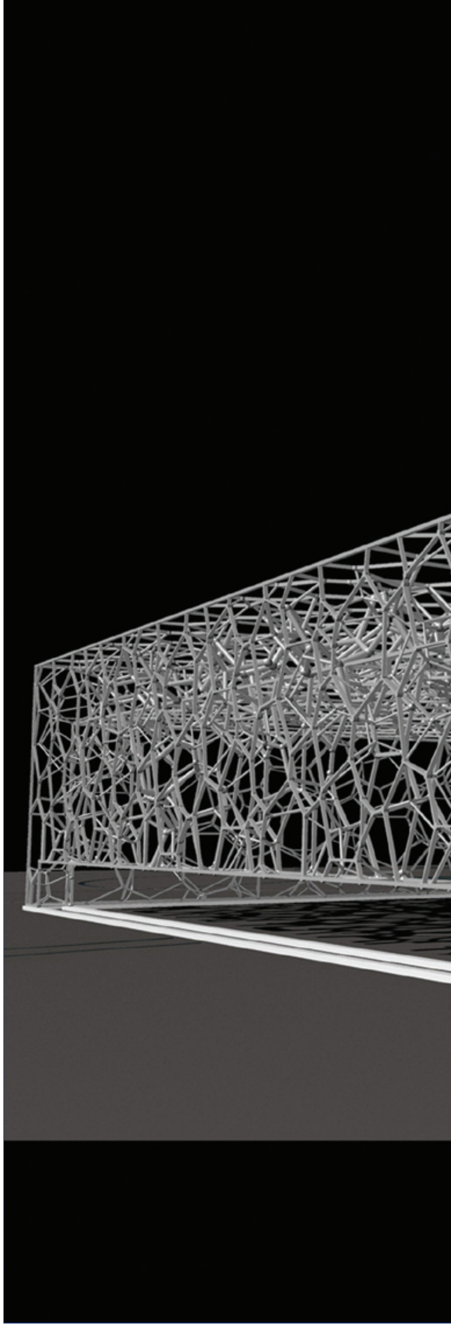
Although the project wasn't scheduled for completion until 2006, Arup's design and documentation input ended in the summer of 2004. As Arup looks down the road to other projects, Bull reflects on what made the Beijing Swimming Centre project a success.

"Bentley Structural's capabilities, such as automatic drawing extraction, dramatically reduced the time needed to produce 2D documentation. Since we didn't have to worry about that part of our workload, we could focus on the 3D model," he said. "And using a MicroStation VBA routine to automatically model the structure saved us quite a bit of time.

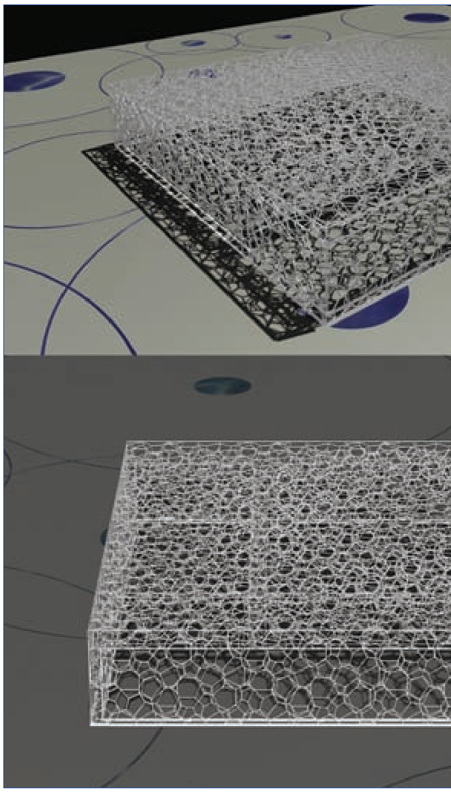
"Also, being able to save files in other formats let us quickly issue drawings to clients and consultants in the formats they needed. Yet we didn't have to give up the enhanced capabilities that Bentley solutions offer us," Bull said.

"That was quite important. If we had been using any other software package, it's unlikely we could have produced such complicated geometry and documentation, and integrated it with structural analysis, especially in the timeframe available."

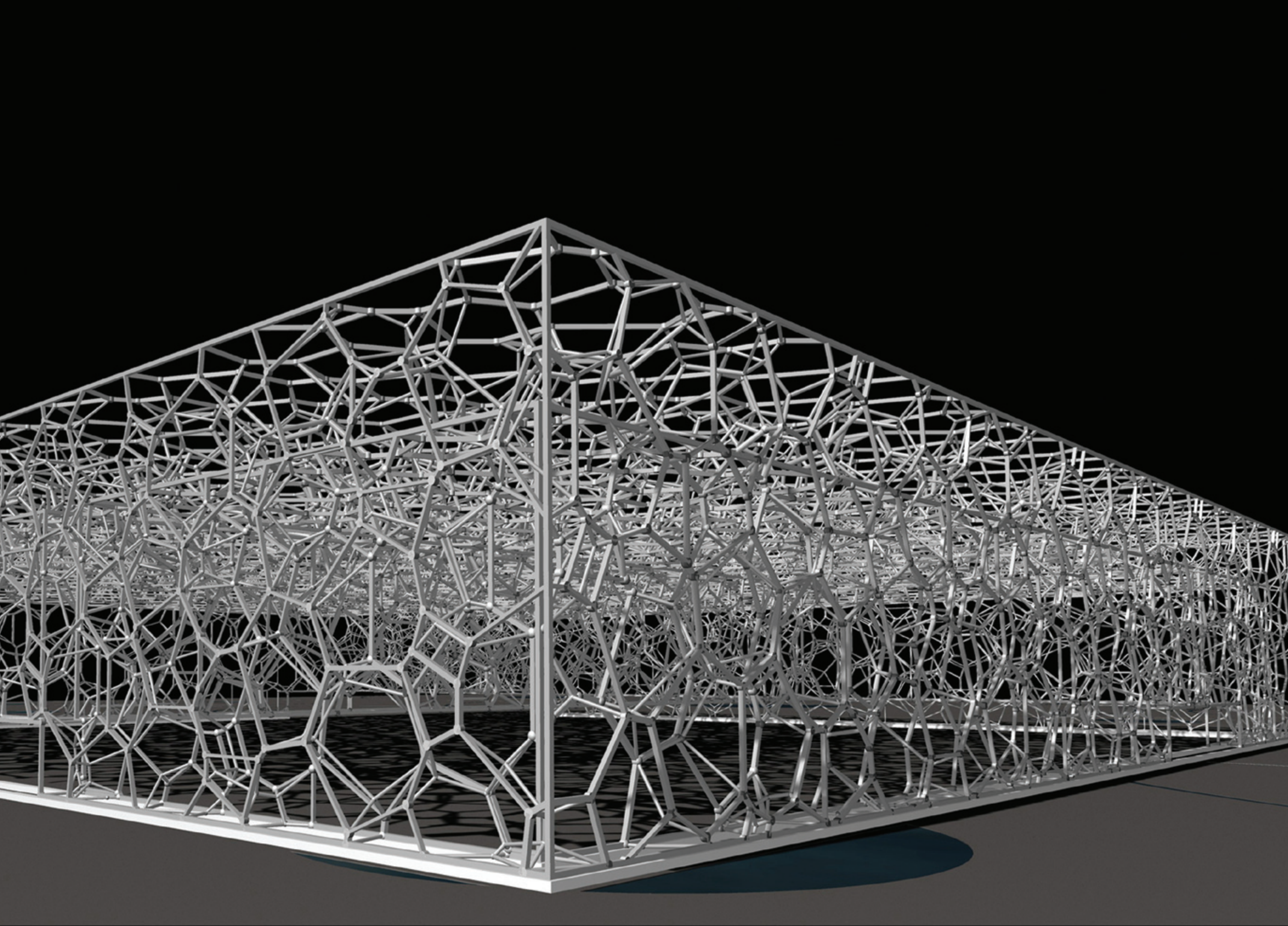
www.bentley.com
www.arup.com



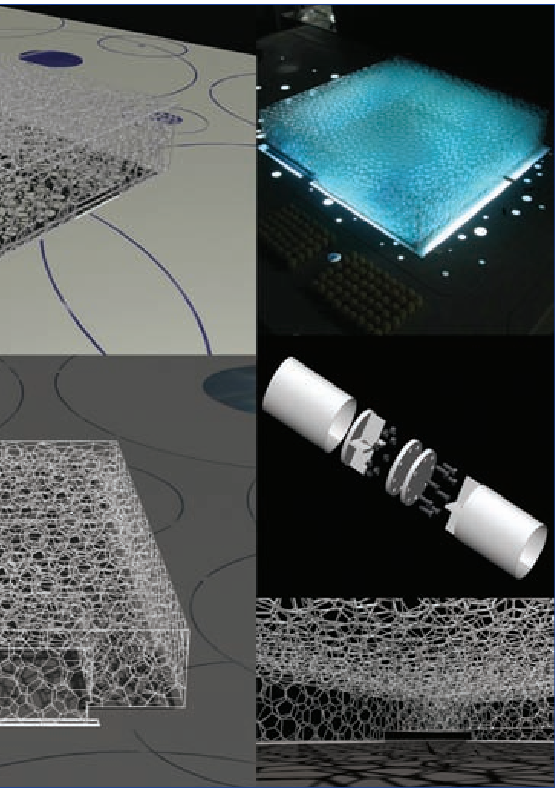
A 3D isometric view of the structural model.
(Image courtesy Arup-PTW-CSEC)

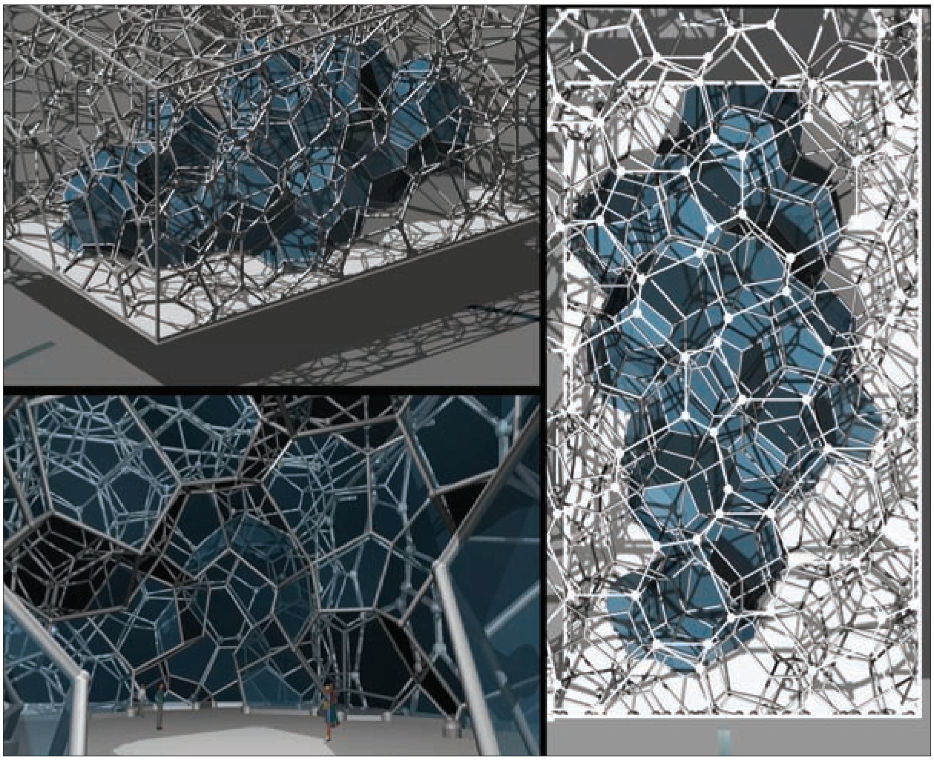


Arup generated a variety of renderings from its 3D model of the National Swimming Centre.
(Image courtesy Arup-PTW-CSEC)



"If we had been using any other software package, it's unlikely we could have produced such complicated geometry and documentation, and integrated it with structural analysis, especially in the timeframe available." **Stuart Bull,** ***Arup senior 3D technician***





3D rendered views of the "Restaurant Cave" above the centre's main entrance. (Image courtesy Arup-PTW-CSEC)

Exactal CostX

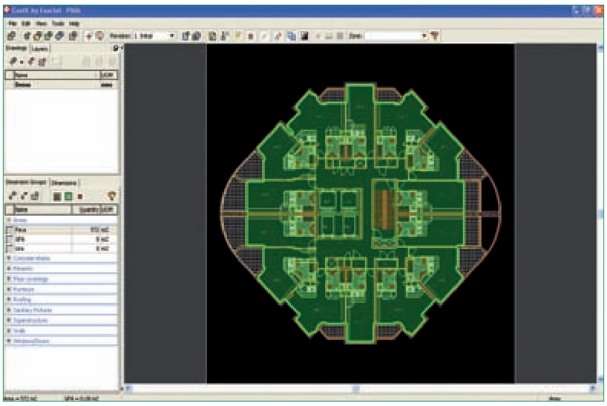
Moving from pencil and drawing board to CAD improved the productivity of designers overnight. However, with so much design information captured in digital form, even greater benefits are possible. **Martyn Day** reports on a costings application that's rapidly growing in popularity.

The main benefit of moving from paper to Computer Aided Design (CAD) is the ease of editing, while removing the need for rework. Now the majority of companies take their CAD systems for granted, it's amazing how many firms still look at CAD as being a better drawing board and not a totally different environment for creating and optimising designs. With the move to 3D, early adopters saw the opportunity to gain the benefits of Building Information Modelling (BIM) — but it is not necessarily the death of 2D drawings, as the output is still the bread and butter of the construction world.

So, how about extending the use of 2D drawings or 3D models beyond mere symbolic representation for builders? With so much really useful, intelligent information included in the CAD file, there are a number of applications that give this data even better return on investment and improve productivity and budgeting of projects. Quantities and Costings seem like an obvious area for digital improvement but most of the tools are stand-alone, take data one way and essentially are 'clunky' to use.

Exactal

Exactal is an Australian-based software developer now operating in the UK that produces CostX, an intelligent tool that assists cost estimates from 2D or 3D CAD data. Launched in 2004, the software is now sold all over the world, including Ireland, UAE, Malaysia, Singapore, Cyprus, New Zealand and across Africa.

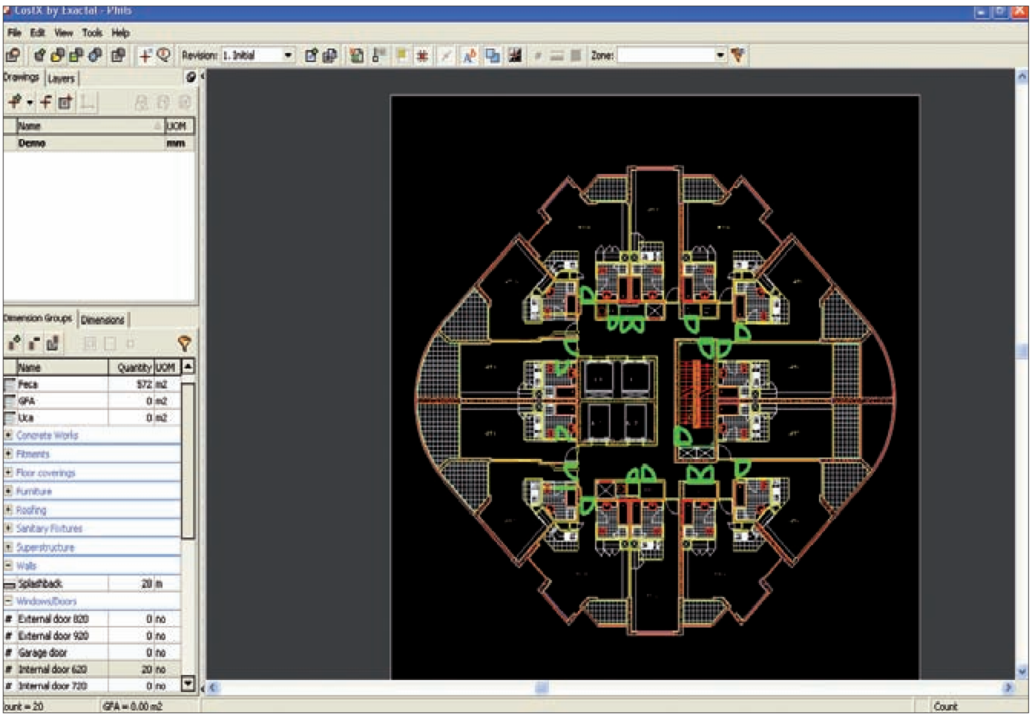


Significant calculations can be easily obtained, such as the gross area of a building, generated from the original drawings.

CostX supports bi-directional links to existing standard formats and industry formats (DWG, PDF, DXF, Revit and in October of this year DGN) and captures project dimensions and quantities using its own 'intelligent cost geometry technology' to generate project estimates. Using a visual-like interface, measurements can be both automatically and manually extracted from CAD files. CAD experience isn't necessary to operate the software and there doesn't need any CAD software to be present on the PC to access the files. All measurements can be extracted to Excel.

CostX supports live links, so changes to any project drawings will automatically be reflected in the costings and quantities of the whole project. The software also offers analysis tools to compare and contrast these changes. The software comes with a range of frequently updated Rate libraries, or users can update or add-in their own custom costings. Then with this data, CostX can generate a raft of reports to aid in the decision process. It also has beneficial applications for Quantity Surveyors, Builders, Developers, Project Managers, Sub-contractors, Valuers, Estimators and Architects.

Obviously for Quantity Surveyors, CostX looks like a powerful solution as it provides a single environment for capturing dimensions, developing feasibility studies and generating full Bills of Quantities. The automatic report writer takes the pain out of repetitive tasks and its output is to a highly-professional presentation quality.



An important capability of CostX is in costing and scheduling the windows and doors in a design. Here the doors are highlighted in green.

CostX Viewer

There is an easy way to share costing estimates with the CostX Viewer. Files can be distributed in a safe read-only, portable format, which can have live links back to the CAD data, offering real-time costings to all project participants or owners. Users of the Viewer can dig very deep into the project dimensions, quantities and spreadsheets, specifically to 'ten levels' deep. The Viewing software also includes drawing interrogation tools. This is a great tool that helps project members to become acutely aware of the cost implications of any changes made.

Conclusion

CostX offers new possibilities for re-using the CAD design data to accurately estimate quantities and costs, within a live environment. The automation of the process will dramatically improve productivity. Some customers have anecdotally reported that work that has typically taken three days to complete can now be done in half a day and the more changes to a project, the bigger the rewards for using the automatic bi-directional cost estimation.

One particularly interesting use of this kind of software would be at the conceptual level, where construction costs, maintenance costs and operational costs could be estimated much earlier in the design process, leading to better optimised buildings. With the push for sustainability and materials becoming increasingly important, CostX could have an important role to play in exploring the performance and cost of any design or proposed design changes.

We will have a full review of CostX in the next edition of AEC. Price £2,000 per seat.

www.exactal.com

Dell Precision R5400

There's a growing trend to take workstations off the desk and into the back room. Dell's new Precision R5400 offers all the power and flexibility of a desktop workstation but is housed inside a 2U rack form factor. By **Greg Corke.**

Back in May HP rolled out its long awaited CAD-focussed Blade Workstation solution. Drawing inspiration from traditional client/server models HP's Blades are housed in a densely populated rack locked away in a secure data centre. Each workstation is controlled remotely by a thin client that sits on an engineer's or architect's desk, but rather than sending 'CAD' data to the client, the Blade transmits live pixel data frame by frame to the client using a high-bandwidth, low latency network. And with mouse and keyboard actions being sent back to the Blade this gives the user a real time experience just as if they had the workstation sat underneath their desk.

Fastforward three months and Dell now has its own take on remote workstations, the rack mounted Precision R5400. This is essentially a standard desktop workstation put into a 2U Rack form factor, and not a Blade server kitted out with workstation graphics as is the case with HP's solution. The template for the R5400 is the Dell Precision 5400 and features virtually identical components to its desktop counterpart. According to Dell, this meant that certification from all the leading CAD vendors was incredibly easy as it had already done all the hard work for the Precision 5400.

Just as with HP's Blade solution, Dell's R5400 Rack workstation transmits pixel data across a high-bandwidth, low latency network. However, whereas HP uses in-house software compression technology to do this, Dell has opted for third-party hardware acceleration courtesy of Teradici. This is in the form of a dedicated PCIe card that sits inside each Rack Mounted workstation and pixel data is compressed, encrypted, sent out over CAT5 and decompressed client side.

While I say client, Dell says Remote Access Device and is keen to emphasise that its FX100 Remote Access Device, which provides the desktop element to the Rack Workstation solution, does not run an Operating system, and does not require any drivers. It's simply connected to the Rack Workstation across a network, and unlike HP's Blade client has no CPU, RAM or solid state memory.

Specifications

Product: Precision R5400 workstation
Supplier: Dell

- One or two Quad-Core Intel Xeon (up to 3.0GHz) or Dual-Core Intel Xeon processors (up to 3.33Ghz)
- Up to 32GB memory
- Up to 2 x 1TB SATA hard drives
- Up to 2 x Quadro FX570 (256MB), Quadro FX1700 (512MB), or Quadro FX4600 (768MB) graphics cards
- Windows Vista (32-bit or 64-bit) with Windows XP (32-bit or 64-bit downgrade, Red Hat Enterprise Linux

Price: On application
www.dell.co.uk/precision

Inside the R5400

Component for component the Precision R5400 is virtually identical to the desktop Precision 5400. Dual socket Dual Core (up to 3.33GHz) or Quad Core (up to 3.0GHz) Xeon processors provide plenty of processing power for CAD, simulation and rendering applications; it can house up to two full size 7,200RPM SATA 3GB/s hard drives (Raid 1 or 0 for performance or redundancy), and most interestingly it has capacity for two high-performance graphics cards, which it supports in its 2U chassis with riser cards.

Dell offers a full range of professional graphics cards inside the R5400 from the entry-level Nvidia Quadro FX 570, right up to the high-end Quadro FX 4600. This gives the R5400 a serious amount of graphics power, and while two high-performance graphics cards will be of limited benefit for most users, this could be an extremely interesting proposition for the future as momentum grows for GPGPU (General Purpose Graphic Processing Unit) technology).

While CPUs have multiple cores, GPUs can have hundreds which makes them ideal for offloading highly parallel simulation and rendering tasks. It's still early days for the technology but we expect big things to happen in this space over the next couple of years.

Finally, memory inside the R5400 is restricted to four DIMM slots. This means a maximum of 32GB of RAM when 8GB DIMMS become available or more importantly affordable, but for now a capacity of 8 or 16GB is more realistic.

Conclusion

A cynic might say that Dell only threw its Rack Mounted workstation together in response to HP's Blade workstation, but that is probably way off the mark for a solution that is as highly flexible, scalable and powerful as the R5400. It's impossible not to draw comparisons between the two solutions and while Dell loses out to HP in terms of compute density by using a 2U Rack it certainly has a clear advantage when it comes to graphics. Dell's R5400 not only offers significantly more 3D power than the mobile Quadro FX 1600M inside HP's Blade but the potential to re-route this power to augment or replace traditional CPU operations should not be underestimated, particularly with simulation and design visualisation growing in all areas of product development.

In terms of the way in which the two solutions transmit their pixel data I'm not going to be drawn into the debate over whether hardware compression is better than software compression, simply because I haven't tested out both systems alongside each other. But what the Dell may gain in terms of taking some of the load off the CPU with its dedicated PCIe card, it loses in flexibility by having to have dedicated hardware at the client side.

What is clear is that both 'remote' workstations offer a compelling solution for those wishing to centralise IT support of their machines, to keep confidential data secure and easier to manage, to make the most of their workstation investment by using it as a ready-made cluster, and to offer 'workstation performance' in inhospitable areas such as the site office. And now with high-end graphics inside the Dell Precision R5400, as long as you have a capable dedicated network in place there is very little a desktop workstation can do that Remote workstation can't. It's going to be an interesting few years to see how things pan out.



Dell's Precision R5400 rack workstation (left) is locked away in a secure data centre, while the FX100 Remote Access Device (right) sits on the desktop and decompresses pixel data sent from the R5400 and feeds back mouse and keyboard strokes.



Visualise your world

Use ATI FireGL™ workstation accelerators with 3ds Max® to visualize your designs.
ATI FireGL™ also certified for AutoCAD® Architecture and Revit®.
For hardware solutions , configured to meet your requirements, including ATI FireGL™ graphics cards and HP® workstations contact Freehand on +44 1483 200111

Image courtesy of www.designhive.co.uk

ATI FireGL GRAPHICS



ATI FireGL™ Graphics Accelerators. No Boundaries.

ATI FireGL™ from AMD destroys previous benchmarks to deliver the premium performance you need to explore new territory with your 3D applications.

Combined with the power of HP®'s comprehensive range of Workstations provides the quality, reliability and performance you need to create your designs in optimal time.

Discover the pixel-perfect accelerator for your application at: *www.freehand.co.uk*



AMD Smarter Choice

ATI FireGL GRAPHICS



GRAPHISOFT®
ARCHICAD 12
a Virtual Building Solution

ACCELERATING
THE DESIGN EXPERIENCE



Discover the Smartest BIM

ArchiCAD 12 is the most complete and flexible design solution for Building Information Modelling (BIM). The multi-processor support in ArchiCAD 12 makes design and documentation incredibly fast. ArchiCAD 12 also introduces a stunning Curtain Wall system and the revolutionary 3D Document, a first for a BIM application. Learn more about how ArchiCAD 12 can accelerate your designs at www.graphisoft.com

Not sure about BIM? In 30 minutes Discover the real power of BIM



Learn how BIM really can help you win more business, create better designs and produce accurate documentation. Hear from architects on why they decided BIM is the right choice and the benefits they have achieved. Read about the experience of architects that have converted from 2D CAD and how BIM has extended the architect's role in environmental analysis and integrated 5D Construction.

Take your knowledge of BIM to the next level with this award winning interactive tutorial and free trial of ArchiCAD



The BIM Experience Kit is a "Stevie" winner (the "Oscars" of Training) in the Interactive Multimedia Training Category for its unique approach in helping architectural users of 2D CAD become familiar with working in BIM. The kit combines a **free 30 day trial of ArchiCAD** with an innovative multimedia training tutorial that guides users through the modelling of a real Frank Lloyd Wright-designed project: the Massaro House in upstate New York.

Register FREE Today: http://info.graphisoft.co.uk/bim

Graphisoft UK Ltd, 21-25 Church Street West, Woking, Surrey GU21 6DJ Tel: +44 (0)1483 263 154 www.graphisoft.com

Picture courtesy of Vörösmarty tér 1, Budapest, Hungary - Architect: György Fazakas, Consulting architect: Jean Paul Viguier.